Pit and Quarry

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# A SIGNIFICANT CRUSHED STONE CONVENTION

MORE than five hundred members and guests of the National Crushed Stone Association laid aside the routine of everyday affairs to attend the eleventh annual convention of the Association at West Baden, Indiana, from January 16th through January 19th. They came from all parts of the country and even from Canada. The weather was ideal, as it generally is in southern Indiana in January. The attendance was larger than at any previous annual crushed stone meeting. There were many more ladies present than have been seen at previous sessions, and for the first time a complete social program was arranged for their special benefit under the direction of Mrs. Grace M. Evans, president of the Monon Crushed Stone Company. The sessions were well planned and the papers varied and as a whole probably more interesting than usual. R. B. Tyler as chairman of the entertainment committee arranged a social program including a smoker and vaudeville show that was a big hit. The annual banquet was a decided success. Colonel O. P. Chamberlain knows how a toastmaster should handle affairs of this kind. The machinery exhibit was the largest and most complete that the association has yet conducted.

Mrs. Grace M. Evans

## Outstanding Features

There were a number of significant features of this convention which will be remembered long after the speeches and entertainment have been forgotten. Included among these is the election of Otho M. Graves to his fourth consecutive term as president. The "do not choose" disposition was probably there, but it did not matter. Mr. Graves has done much during his previous three years as president in starting new activities, and he appears to be destined to carry those through that have not yet been completed.

Another feature was the raising of the necessary funds for the establishment of a research laboratory. The fund for this laboratory was started before the convention, but not sufficient money had been raised when the convention opened. During the convention $10,000 more was received bringing the total to a little more than $23,000, which assured the laboratory to the industry. W. L. Sporborg, president of the Rock Cut Stone Company and A. S. Lane of John S. Lane and Son each made a personal donation of $2,000. The Manufacturers Division contributed something more than $3,000. At least $25,000 was wanted, and $30,000 was established as the ideal sum. By the time this article is in type the $25,000 at least will probably have been received.

Another significant event was the attendance and introduction of R. C. Fletcher, president of the National Sand and Gravel Association. Mr. Fletcher attended the convention as a guest and at the invitation of Mr. Graves as the representative of the sand and gravel industry. Cooperation between these two associations on problems concerning mutual benefit would be a real power in matters such as freight rates, highway appropriation legislation, etc.

In our opinion an outstanding feature was the occasional occurrence in discussion and speeches of the question of markets, prices and association activities concerning them. The suggestion of J. R.

This is the Larger Portion of Those Present Assembled in the World Famous

Thoenen in behalf of the Bureau of Mines that a confidential analysis be made of the cost of producing stone was accepted, and if the individual producers cooperate, this will be a benefaction to the industry.

A confidential exchange of cost figures through the association among the member producers would have a stabilizing influence on the industry. Two factors generally govern any price policy, namely; the condition of supply and demand, and the cost of production. To our knowledge there are many producers in the crushed stone industry who have no cost system and who know only vaguely their costs. There occurs frequently selling below cost without knowing it, and this competition has a disastrous effect. A uniform cost accounting system could be adopted by each trade association and statistics compiled showing without identification the individual detail costs of their members. Such information would undoubtedly tend to bring prices into closer relation to actual cost of production. It would afford the smaller producer who cannot maintain a cost system a gauge of the average cost of production in the industry. It certainly is not good economics to knowingly sell below cost unless the market conditions compel it. There is a great need for education of that class of producer who repeatedly decreases prices in total ignorance of costs. Such competition is not efficient. It is, in fact, harmful to others.

The financial condition of any association is of paramount importance, and the financial report presented for 1927 was significant because it showed an income of more than $47,000 which will be in excess of $50,000 in 1928.

The report of a gain of 25 active members involving 354 new memberships and bringing the total to 1296 was also significant. It shows that the association is gaining ground in its endeavor to represent literally the entire industry. It will be a splendid day when the report can be made that the association has within its organization a majority of the individual crushed stone companies in the industry.

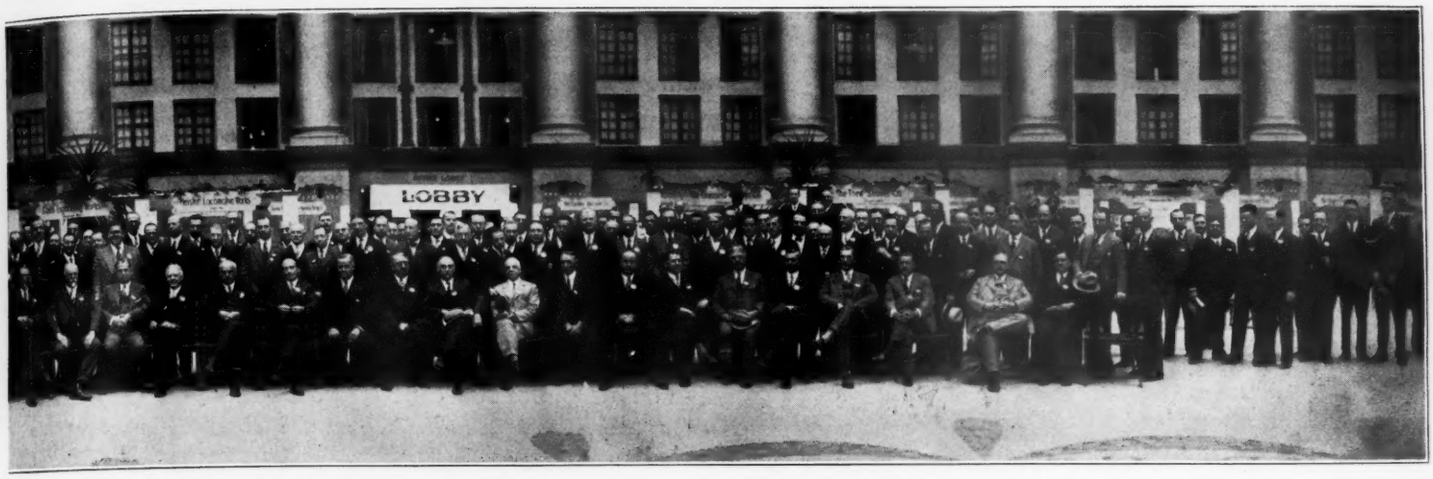
## Opening Session

The conventon was called to order on Monday morning by President Graves who introduced A. J. Wedeking, a member of both the Indiana legislature and the state highway commission. Mr. Wedeking was able to make his address of welcome something different than the usual because of his intimate knowledge and contact with the highway problems and program of Indiana. He discussed briefly the historical background of Indiana. He pointed out that Indiana is maintaining 5000 miles of road in its system and that it has more Federal highways running east and west than any other state. He stated with pride that Indiana would shortly have a highway system second to none in proportion to the number of people. Attention was called to the peculiar geographic position of the state, which necessarily directs a large traffic over Indiana highways.

L. R. Cartwright, vice president and general manager, Midwest Crushed Stone Company, responded to the address of welcome on behalf of the association and further welcomed the entire assemblage on behalf of the Indiana producers. Mr. Cartwright is a real Hoosier, and he added some interesting facts concerning his state that were pleasing to hear. He pointed out that Indiana was one of four states without any bonded indebtedness and that only two other states have as low a per capita tax. He also called attention to the Bedford Bloomington district which is famous for its Indiana limestone that has been shipped into every state in the Union and became a part of a long list of this country's most remarkable buildings.

The address of Otho M. Graves was quite informal but instructive and entertaining. Mr. Graves knows how to discuss subjects tactfully and graciously. The impressive factor is the way he says it.

Mr. Graves briefly reviewed the activities of the past year and touched also on the early history of the association. Attention was called to the fact that the sixteenth of January was the tenth anniversary of the first organization of this association.




Rotunda. The Machinery Exhibit Was In Three Rows Around the Outside Diameter.

The association activity with other engineering groups and associations was briefly mentioned and its value was emphasized. The fact that Mr. Graves had traveled 8,850 miles during the past year and 37,880 miles during the past three years on association business was indicative of some of the time personally devoted to the office of the president. This mileage includes that memorable transcontinental tour when the value of the association was presented to groups of crushed stone producers from coast to coast. The work of the engineering bureau was referred to briefly.

These were all matters of the past, and Mr. Graves also wanted to remind the association of some of the problems of the present,—the research laboratory. The simple facts surrounding the needs for such a laboratory were pointed out and the necessity for additional funds emphasized. The success of Mr. Grave's talk is in the fact that more than $10,000 additional was raised, as was mentioned in a previous paragraph.

Mr. Graves expressed appreciation for the cooperation of the other officers and directors. He charged the future of the association to the new board of directors which was to be elected later in the convention.

Mrs. Grace M. Evans was commended highly for her successful arrangement of the ladies' program. Col. R. B. Tyler was also given credit for his untiring efforts in connection with the convention program.

Several individuals were introduced to the convention for particular reasons as noted. A. R. Wilson, Granite Rock Company, came all the way from Watsonville, California. W. S. Primeley, president, Wisconsin Granite Company of Chicago. A. J. Wellington of Newton, Mass., Bernard M. Kenney of West Roxbury, Mass., T. C. Cook of Swampscott, Mass., and J. H. Cooke of Hartford, Connecticut as new members. F. O. Earnshaw was congratulated on his being elected president of the Carbon Limestone Company.

## Directors' Report on Business Conditions

The balance of the morning session on Tuesday was given over to the reports of the directors on business conditions during 1927 and the outlook for 1928. These reports were interesting to the entire convention; and while they represent sectional viewpoints, they do as a collection present an excellent interpretation of conditions. These reports are as follows:

### W. M. Andrews

It is with regret that I must sound a pessimistic note after so much optimism, but as the experience of the Western Pennsylvania producers may show the necessity for a laboratory for our Engineering Bureau my remarks may not be amiss.

The contracts let by the State Highway Department in Western Pennsylvania from January 1 to September 1, 1927, which included all jobs on which any work was done during the past year, show that stone was used on only 36.2 per cent while slag was used on 63.8 per cent.

Our local Association had several meetings with Mr. Goldbeck on this situation but owing to the lack of a laboratory he was unable to furnish us with data which he felt sure would help our cause but which he was unable to prove, therefore could not use.

Fortunately for us we were able to get in a little intensive work with the State Highway Department and the prospects for 1928 are much brighter, but still far from perfect.

May I not ask, gentlemen, that you allow our experience to serve as a warning, and get behind this movement for a properly equipped laboratory so that Mr. Goldbeck may carry out experiments which will benefit the entire Stone Industry.

### H. E. Bair

The demand in 1927 was steady and assisted by fair weather, production and sales resulted in a healthy increase in tonnage consumption as compared with the year 1926. There were no marked

Otho M. Graves Reelected President

improvements in production methods but there is a general tendency towards improved preparation. There is still in this territory an overproduction with more than sufficient capacity to meet all requirements. There has been very little development of new properties or increased production facilities at old locations. Competition being extremely keen, as evidenced by the fact that in view of increased sales, the average price was approximately the same as received during 1926. Plants with an unfavorable operating experience and high costs have been compelled in some cases to suspend operations entirely while in other instances they have had to limit sales within a profitable radius of sales territory.

Present advice received from consumers and producers indicate less optimism for as large a consumption this year as we had a right to anticipate at the beginning of the year 1927. Reduced railway revenues is causing a certain amount of pessimism in railway circles and if this condition continues, a reduction in the use of railway ballast and for all other railway uses will be experienced. Plans for improvements and maintenance of tracks now being made call for as large a program as in 1927, all of which of course is subject to their financial condition at the time of purchase. There are no present indications of a slowing up in building, paving or road construction. It is anticipated the demand for all commercial purposes will equal that of the past year. The consumption of limestone for industrial purposes will necessarily be limited by the same factors governing expenditures on the part of the railways.

## A. J. Blair

In general, business in 1927 was poor both as to volume and price. Wisconsin, unfortunately for us stone men, is blessed with an over-abundance of good stone and gravel deposits. About our only real hope for the future is in a statement recently put out by our State Highway Department, that in the building of a few concrete roads this year they will specify the strength required instead of specifying the mix, the latter being left to the contractor.

Thus if concrete of the requisite strength can be made with crushed stone and less cement put in, then the stone producer may be able to meet the competition of the cheaper aggregate. This idea has to be proven and sold to the contractor. We stone men have long believed it to be true. The National Engineering Bureau and Research laboratory can help us in this.

Our state has pioneered in building concrete roads, and if we in Wisconsin can get this plan successfully worked out and adopted, it will undoubtedly benefit the whole country.

## C. D. Brewer

Reporting for the four producers in Minnesota, C. D. Brewer reported that January is a poor month for one from this State to make an optimistic report unless he is either a Finlander or an Eskimo, because the cold weather up there stops most work. Therefore, you must not expect to hear any words of encouragement.

Nineteen twenty-seven can be considered as having been about a normal year for the stone producers when looked at from a tonnage viewpoint, but when considered on the question of sales price, it was poorer than usual. Many members of this Association do not know that the greater portion of the surface of the State of Minnesota is made from a glacial deposit of sand and gravel. This natural condition encourages temporary plants, some of which are owned by the contracting firms themselves. Such a condition quite naturally restricts the territory to which stone producers can reach with their products.

Nineteen twenty-eight looks like a repetition of 1927 for there are no prospects of our receiving higher prices nor much of an increase in tonnage. Our Highway Department has most of its contracts already let and these contracts largely cover the connecting links, or short stretches of hard surfaced roads that have already been constructed, so that the tonnage required for State work is going to be less than usual. Building operations are about at a standstill and it is too early for any producer

to make an intelligent guess as to the amount of building that will develop during the first half of the year.

### L. R. Cartwright

Most of the Indiana producers have enjoyed a fair increase in business during last year over that of 1926. Favorable weather conditions throughout the fall gave contractors opportunity to complete their work. This fact, coupled with good business conditions, generally has tended to reduce the amount of accounts receivable on stone producers' books to a comparatively low figure.

An usually rainy spring and early summer made it impossible for farmers to use a great deal of agricultural limestone and the demand for this product was somewhat reduced. Weather conditions during the summer and fall were extremely favorable, however, for maturing crops and the farmer is now in a more optimistic mood. If conditions in the spring and early summer are favorable, the farmer is going to be in the market for agricultural limestone which he has not used during the last two years. If prices are kept stabilized, a good margin of profit will be enjoyed on this product.

The plan of the State Highway Commission to reclaim many of our highways with penetration macadam and their use of bituminous retread for maintenance is being copied by a number of our counties and is thus furnishing us an added market. The results where this type of construction and maintenance is practical, are working great economies within our State.

The tonnage in territory covered by our operations, which includes Central and Southern Indiana and Illinois, promises to be much the same as last year, with little change in prices.

### O. P. Chamberlain

The outlook for 1928 business in the crushed stone industry, Chicago District, is that the volume of business will be about the same as in 1927.

During 1927 considerable of the State Highway construction was contracted for and constructed, thus putting the $100,000,000 Illinois State Bond issue to work. The stone industry in this District benefited materially through this highway construction.

Much highway construction, consisting of the building of new roads, as well as the widening of existing concrete roads in Cook County, is now well under way. Some few roads have been widened. Much road widening from existing structure of 18 feet to 20 feet to a width of 40 feet has been authorized by the Cook County authorities and construction will proceed early in 1928.

General housing including residences, office buildings, hotels, clubs and similar construction work, will probably run in 1928 not over 75 per cent of the volume of this character of construction built

R. C. Fletcher, President National Sand and Gravel Association, Attended

in 1927. It is the hope of the Chicago District operators that the increase in volume of road construction will at least offset this prospective falling off in other structural work.

It is difficult at this time to predict what agricultural limestone business of 1928 will be. The 1927 season, following bad weather conditions for harvesting in 1926, and a general pessimism among farmers and bankers as to the financial conditions in the rural district, resulted in the 1927 business being no larger than that of 1926.

Prices of agricultural limestone were very low in 1927 and promise to remain low for the greater part of the period of 1928. These low prices should induce farmers to purchase in better quantity than during the past two years. They appreciate the value of agricultural limestone for acid soils and it is hoped that they will take advantage of present conditions in the manufacturing of agricultural limestone and thus increase our volumes of sales for 1928 over 1927.

Prices generally were no higher in 1927 than in 1926. Most of the producers are optimistic enough to predict better prices for 1928. As the cost of production of crushed stone in this district is somewhat higher now than it was a year ago, with no prospect of a recession in cost, earnest effort should be made by all operating producers to advance the price at least sufficiently to overcome the increased cost of production. It is believed by most of the

producers in this district that this will be accomplished in 1928.

### C. M. Doolittle

Business conditions in Canada during the past year showed marked improvement, and the prospects for 1928 are even brighter. Four contributing factors to the above condition in Canada are worth noting:

1. 1927 grain crop largest yet harvested.
2. Canada now has third largest gold deposit in world.
3. Greater wealth per capita than any other country in the world.
4. Largest deposits of nickel ore in the world.

At the end of 1927 the Province of Ontario had completed the construction of:

| | |
|---|---|
| Concrete pavement | 577 miles |
| Asphaltic concrete | 263 miles |
| Bituminous penetration | 228 miles |
| Macadam | 433 miles |
| Gravel | 910 miles |
| Total | 2,411 miles |

The construction programme of 1927 entailed an expenditure of $7,250,000, and some $2,750,000 was spent on maintenance.

The 1928 programme calls for an expenditure of some $7,000,000 and $3,000,000, for maintenance, and contractors have been asked to submit tenders for the first letting, Feb. 8, 1928—Concrete, 60 miles, mixed macadam 30 miles.

Probably all of the 1928 work will be let this winter, giving the contractors an opportunity to get their equipment in shape and make an early start in the spring. It will be noted that many miles of the new type of mixed Macadam road, designed by R. M. Smith, Deputy Minister, are to be constructed. This type of road is of interest to Crushed Stone producers in that it provides an outlet for screenings—requires some five thousand tons of stone per mile, and eliminates detours.

In addition to the moneys expended by the Department of Public Highways on what are termed their own Provincial highways, grants are made for County and township roads, amounting to thirty to fifty per cent of the cost of the same, and this has resulted in the Counties and Townships instigating quite an extensive road building programme. While considerable work was done in 1927, much more is contemplated for 1928, and the outlook for the Crushed Stone producers in this direction is very good.

The Canadian Pacific Railway and the Michigan Central Railway in Canada have for a considerable number of years used a large tonnage of Crushed Stone for their ballast requirements. In 1926 the Canadian National Railway started rock ballasting, and in 1927 their ballast requirements were doubled. It is the opinion of the officials that 1928 will again see a very marked increase in the amount of rock ballast to be used by the road. The railways in this country have used nothing but Crushed Stone for their main lines, and the Crushed Stone producers in Canada can look forward optimistically in regard to the future of the ballast programmes of the railways.

Many large and important structures are planned to be built this coming year. The Canadian Pacific Railway Co. is building a Ten Million Dollar hotel in Toronto, and the other contemplated projects in this city run into some forty million dollars. Various other cities in the country have large building programs. To sum up the situation from the Crushed Stone standpoint, prospects are exceedingly bright for 1928.

### A. S. Lane

Have been in communication with most of the Massachusetts producer members and the reports as to conditions are practically uniform throughout the State.

Apparently the tonnage for 1927 was about 15 per cent over 1926. Prices running without much change and general conditions being good, except that two refer to collections as slow.

For 1928, all are apparently expecting still better business without much change in prices. While the flood damage in Vermont and New Hampshire was very heavy it is not thought that this cause will particularly increase the tonnage, although Massachusetts quarries supply much of the material used in those states.

One member only spoke of increasing plant capacity this winter. I think it may be said that the industry in Massachusetts is in a fairly healthy condition.

### I. A. Ogden

1. The total tonnage marketed by the Southwestern Division of the N. C. S. A. was 1,577,000 tons. This total is approximately 90 per cent of the total production in Texas.
2. With the exception of one plant, the producers reported that railroad service was very satisfactory.
3. The labor situation during 1927 was good. No shortage of labor was expected.
4. Insurance rates including tornado, fire, and compensation insurance are considered to be high.
5. For the coming year, 1928, prospects are for an increase in tonnage. Highway construction in the state of Texas should be much larger than during 1927, as a much larger program of surfacing or paving projects is contemplated.

### Russell Rarey

Stone sales for 1927 were good, approximating our 1926 tonnage. Stone for construction work and road building experienced fairly satisfactory demand. Weather conditions throughout the year

almost ideal for quarrying operations and construction work. Favorable weather contributed to early completion of many projects, flattening out demand during late fall months. Labor conditions satisfactory. Year as a whole was good, although much tonnage lost to competitive materials on account of the increased production of, and lower price on, substitute materials.

Nineteen twenty-eight has every indication of being a satisfactory year for the stone business. Road construction and maintenance is adequately financed for 1928, and we should be able to secure a fair portion of this business.

Building construction continues to maintain a high level, with prediction for continued high building activity in 1928. This in spite of the fact that Central Ohio is now provided with more than adequate supply of dwellings, apartment houses, office buildings, theatres, hotels, etc. It is believed we shall experience a shrinkage in building construction during 1928. Railroads are in excellent condition financially, and should take a fair volume of ballast for maintenance and renewal purposes. No new lines, and but little double tracking, is scheduled in our vicinity, hence ballast tonnages will not reach high level. Barring the possibility of business reaction due to 1928 being Presidential year it would seem that 1928 should be fairly satisfactory, although not so good as 1927.

### John Rice

Speaking from my knowledge of the business conditions affecting crushed stone in the Middle Atlantic States and Eastern New England, I am glad to report a very successful experience last year, as regards railroad ballast, highway construction and other uses.

The relations of competitors were cordial and co-operative, having purchased and sold fairly large quantites to tide over shortages and peaks.

From information gathered from our branch sales managers and from knowledge gained through my connection with the Atlantic States Shippers Advisory Board, I am inclined to believe that 1928 stone production will prove to be quite as vigorous as that of 1927, even the general business may meet with a slight decline, both because of catching its breath for another rush and because of the usual distractions of a Presidential campaign.

### H. E. Rodes

The outlook in Tennessee, Western Kentucky, is exceedingly good for 1928; in fact a shade better than 1927, which, in this same territory, proved to be a good year for the stone industry.

This outlook looks very much more optimistic because of the very effective and capable work done by Mr. Goldbeck, with the Tennessee State Highway Department in the latter part of 1926, and his work is bearing fruit in the form of the Highway Department taking bids on concrete pavements using the alternate aggregates of gravel and stone, and they are willing to pay more for stone aggregate than for gravel aggregate.

We have found the co-operative work of the Tennessee Crushed Stone Association, functioning as a branch of the National Association, to be of considerable value, both in the work that it does and in the impression that it creates in the minds of others.

### F. W. Schmidt, Jr.

The crushed stone business in the northern part of New Jersey, for the season of 1927, was good; the car supply was adequate and labor conditions satisfactory. The weather was favorable during the early part of the season, but operations were held up somewhat in the late summer and fall because of excessive rains. Competition was keen and in many cases the selling price was slightly less than it should have been.

The outlook for 1928 is fair, demand for material for road construction purposes should be slightly better than the average. The railroad construction and ballast work will require about the usual amount of material, but this of course will be influenced to a large extent by general business conditions. If the roads do a large volume of business they doubtless will require more materials, but if on the other hand general business slacks off the railroads will doubtless desire to cut maintenance cost. The building construction program, requiring the use of crushed stone, is not large and not much demand is looked for from this source.

Capacity of the plants operating in this territory is in excess of estimated requirements. So far as it is possible to determine at this time, normal operating conditions for the 1928 season are looked for, they will of course be largely governed by weather conditions.

### W. L. Sporborg

In the State of New York our business was good in 1927. Some concerns, not all, had their very best year. Labor was adequate for our needs and for the needs of our customers. Rail transportation continued at its high level of efficiency. The motor truck again increased. Railroad ballasting was about the same as in 1926. Highway construction was more.

The future carries the promise of continued prosperity. Agriculture has improved somewhat. Industry earns profits. Good wages are paid. Labor has employment. Our standard of living, our railroad efficiency, inventories, small losses from instalment sales, the ease of credit, our enormous buying power, all work together for activity. We are building this wonderful highway system. We are rebuilding our cities. We cannot believe that all the work we see, waiting to be done, will be permitted to stop. We can more easily believe that

more effort, more materials, more labor, more accomplishment, rather than less, will be required of us as time goes on. Our standard of living in this wonderful country of ours, our modern homes, our leisure, the new foods we eat, the good clothes we wear, the ease of communication and travel, all may seem primitive in the years to come. The best years are still ahead.

### J. W. Stull

The time alloted for this report will only permit me to touch the high spots and these spots, I am glad to report, are higher up on the scale of prosperity than ever before in the history of the crushed stone business in the South.

During the year 1927 general building prospects were above normal and road construction requiring the use of crushed stone was in Virginia and many other of the southeastern states greater than in 1926. The quantity of railroad ballast used was in some instances reduced on account of freight rate complications in the coal industry and because of this some of the quarries in the district suffered serious losses. On the whole, however, it is to be noted that the southeastern quarries produced more crushed stone for all purposes in 1927 than ever before in their history. Selling prices, however, were lower than in former years and the tendency of the business has been in this direction for some time.

Nineteen twenty-eight begins with a hard times howl. The railroads in many instances have reduced ballast quantities and a reduced number of building projects are being put under way. Road construction is still going and a normal tonnage of stone will be used in our district for this purpose. On the whole, however, the outlook is not as pleasing to me as it was in January, 1927. In closing, Mr. President, I want to rivet the attention of the members of this association to one fundamental fact that is taking root in the minds of those who have to do with specifying materials to be used in all building trades, namely, the foundation and structure must be composed of they very best material obtainable. This opinion is slowly but surely causing crushed stone to be written into specifications where formerly competitive cheaper material was permitted. Am sorry that lack of time does not permit me to enlarge on this point as it affects all of us alike now and in the future.

### A. R. Wilson

The year 1927 has been a period of proverbial darkness before the dawn, as far as the crushed stone industry in Central California is concerned. Business has been irregular and rather demoralized from the price standpoint but better times are indicated in the near future.

A tremendous overproduction in the gravel industry has had a tendency to drive prices down to the point where very little, if any profit has been realized by the producers. The selling price of material has been subjected to considerable fluctuation, as each individual job of any size has had its own set of prices. The total volume of business for both crushed stone and gravel was not in excess of 1926, if as great, and several new gravel plants were added to the ranks of the producers. This slowing up in business was due in part to a curtailing of building operations in the San Francisco Bay District. The volume of highway construction, both by the State and Counties, was less, and railroad expenditures were only average.

The outlook for the year 1928 is somewhat better. The state of California has added one cent per gallon to the gasoline tax for new highway construction. The city of San Francisco has voted a bond issue of $9,000,000 to be spent during the next two years for boulevards furnishing additional outlets to the city. In addition, considerable building construction is contemplated for this year.

There is a tendency among state and city engineers to specify crushed material for concrete aggregates. However, the gravel producers have succeeded in having crushed gravel approved in many instances and the sale of crushed stone has to be on the basis of the superior quality of the product. If cheap and plentiful credit continues during 1928, material producers in this section of the state should have a year of average prosperity.

## Officers and Directors Elected

The Nominating Committee presented the following nominations for officers and directors for the year 1928 and they were elected by the convention. J. R. Bryd was re-elected secretary and James Savage treasurer.

President: Otho M. Graves.

Regional Vice Presidents: Mortimer Wandell (Eastern), New York, Allen Patterson (Central), Ohio, T. I. Weston, (Southern), South Carolina, W. F. Wise (Southwestern), Texas, W. R. Sanborn, (Northern), Illinois, A. R. Wilson (Western), California, C. M. Doolittle (Canadian), Canada.

Directors: W. M. Andrews, Ohio, H. E. Bair, Ohio, A. J. Blair, Wisconsin, W. W. Boxley, Virginia, C. D. Brewer, Minnesota, L. R. Cartwright, Indiana, O. P. Chamberlain, Illinois, J. E. Cushing, New York, W. Scott Eames, Connecticut, E. E. Evans, Ohio, F. O. Earnshaw, Pennsylvania, F. T. Gucker, Pennsylvania, W. P. Hodgkins, Illinois, J. C. King, Ohio, E. J. Krause, Missouri, A. S. Lane, Massachusetts, Harry Landa, Texas, Thomas McCroskey, Tennessee, R. N. McDowell, Missouri, F. C. McKee, Pennsylvania, F. C. Murphy, Illinois, Stuyvesant Peabody, Illinois, E. U. Ragland, North Carolina, Russell Rarey, Ohio, John Rice, Pennsylvania, H. E. Rodes, Tennessee, James Savage, New York, F. W. Schmidt, Jr., New Jersey, J. F. Schroeder, Iowa, W. L. Sporborg, New York, J. W. Stull, Virginia, R. B. Tyler, Kentucky, G. J.

Whelan, Ohio, A. L. Worthen, Connecticut.

From the Manufacturers' Division: C. B. Andrews, New Jersey, M. B. Garber, Ohio, and E. G. Lewis, New York.

## Convention Sessions

The general convention sessions were held on Monday morning, Monday afternoon, Tuesday morning, Wednesday morning and Thursday morning. The operating men, superintendents and manufacturers held a group session on Tuesday afternoon. The salesmen also held a group session on Tuesday afternoon. The National Agstone Association heeld its annual meeting on Wednesday afternoon. An accident prevention conference was also held on Wednesday afternoon.

The papers presented before the different sessions will be published in Pit and Quarry either in full or abstracted form. Several papers presented appear elsewhere in this issue. And the others will be published in the February 15 and February 29 numbers. As these three issues will carry the complete papers, a resumé of the sessions will not appear here.

## Social Program

Mrs. Grace M. Evans, president of the Monon Crushed Stone Company, arranged the program for the ladies in attendance. Teas, bridge, five hundred, vaudeville, drives, lunches and a visit to the winter quarters of the Robinson circus made up this program.

Col. Tyler arranged a smoker and a vaudeville show. The smoker was for men only and consisted of five boxing bouts, one of which was a clever burlesque. A seven piece orchestra and a jug band supplied plenty of music. The vaudeville show was held in the famous Rotunda and consisted of several splendid acts brought in from Chicago. This feature was attended by the entire convention registration.

The banquet on Wednesday evening was a colorful affair with the ladies and an attendance of about 500. F. H. Van Orman, Lieutenant Governo of Indiana; A. J. Brosseau, president, Mack Trucks, Inc.; Norman Hapgood and George E. MacIllwain, made up the list of speakers. Col. O. P. Chamberlain was Toastmaster.

## Manufacturers Division Elects

The following officers and directors were elected by the Manufacturers Division:

C. B. Andrews, Chairman, Taylor Wharton Iron and Steel Co., High Bridge, N. J.

J. R. Boyd, Secretary, 651 Earle Building, Washington, D. C.

The following vice chairmen were elected:

H. M. Davison, The Hayward Co., New York City.

H. T. Graceley, Marion Steam Shovel Co., Marion, O.

M. S. Lambert, Robins Conveying Belt Co., Chicago, Ill.

B. G. Shotton, Hendrick Mfg. Co., Pittsburgh, Pa.

L. W. Shugg, General Electric Co., Schenectady, N. Y.

The following were elected as representatives on N. C. S. A. Board:

C. B. Andrews, Taylor Wharton Iron and Steel Co., High Bridge, N. J.

E. G. Lewis, Bucyrus Erie Co., New York City.

M. B. Garber, Thew Shovel Co., Lorain, Ohio.

The following were elected to the Board of Directors Manufacturers' Division:

C. B. Andrews, Chairman, Taylor Wharton Iron and Steel Co., High Bridge, N. J.

T. L. Burrell, Burrell Engineering & Construction Co., Chicago, Ill.

Gordon Buchanan, C. G. Buchanan Co., New York City.

H. M. Davison, The Hayward Co., New York City.

N. P. Farrar, Harnischfeger Corporation, Milwaukee, Wis.

M. B. Garber, The Thew Shovel Co., Lorain, Ohio.

R. W. Gillespie, Jeffrey Manufacturing Co., Columbus, Ohio.

Fred A. Gill, Gill Rock Drill Co., Lebanon, Pa.

N. S. Greensfelder, Hercules Powder Co., Wilmington, Del.

R. Grubb, Canadian Explosives Co., Ltd., Montreal, Canada.

John M. Johnson, Allis Chalmers Manufacturing Co., Milwaukee, Wis.

M. S. Lambert, Robins Conveying Belt Co., Chicago, Ill.

E. G. Lewis, Bucyrus Erie Company, New York City.

Thomas MacLachlan, Vulcan Iron Works, New York City.

A. E. Reed, W. S. Tyler Co., Cleveland, O.

S. R. Russell, E. I. du Pont de Nemours & Co., Wilmington, Del.

B. G. Shotton, Hendrick Manufacturing Co, Pittsburgh, Pa.

L. W. Shugg, General Electric Co., Schenectady, N. Y.

## Among Those Present

### Active Members

Adams, C. G., The France Stone Co., Bloomville, O.
Adams, W. J., Cushing Stone Co., Schenectady, N. Y.
Albright, R. H., Grove City Limestone Co., Grove City, Pa.
Allen, H. B., General Crushed Stone Co., Philadelphia, Pa.
Andrews, Wm. M., Lake Erie Limestone Co., Youngstown, O.
Armstrong, Wm. A., Universal Granite Quarries Co., Chicago, Ill.
Atwood, E. R., Old Colony Crushed Stone Co., Quincy, Mass.
Avril, Arthur C., The France Stone Co., Toledo, O.
Babcock, B. R., The Callahan Road Improvement Co., South Bethlehem, N. Y.

Bair, H. E., The France Stone Co., Toledo, O.
Bales, M. M., Elmhurst Chicago Stone Co., Elmhurst, Ill.
Balfe, Geo. H., Monon Crushed Stone Co., Monon, Ind.
Bamberger, M. M., Interstate Cr. St. Co., Springfield, N. J.
Bannister, A. H., Brownell Improvement Co., Chicago, Ill.
Barres, A. G., General Crushed Stone Co., Wilkes-Barre, Pa.
Baylor, Claude L., Louisville Cement Co., Speed, Ind.
Baylor, Harry D., Louisville Cement Co., Speed, Ind.
Beam, C. C., Melvin, O.
Beerhalter, J. R., Duluth Crushed Stone Co., Duluth, Minn.
Bengston, A. L., A. C. O'Laughlin Co., Chicago, Ill.
Bibb, F. F., Genesee Stone Products Co., Batavia, N. Y.
Black, G. G., The France Stone Co., Toledo, O.
Black, W. J., Brownell Improvement Co., Chicago, Ill.
Blair, A. J., Lake Shore Sand & Stone Co., Milwaukee, Wis.
Blakeslee, Harold L., Connecticut Quarries Co., Inc., New Haven, Conn.
Bonnell, L. C., F. R. Upton, Inc., Newark, N. J.
Boyd, J. R., Nat'l Crushed Stone Ass'n, Washington, D. C.
Brandon, H. H., The Ohio Marble Co., Piqua, O.
Brewer, Chas. D., Duluth Crushed Stone Co., Duluth, Minn.
Brewer, R. D., Connecticut Quarries Co., Mt. Carmel, Conn.
Britt, D. C., Great Notch Corp., Newark, N. J.
Buchholtz, Clarence L., Genesee Stone Products Co., Batavia, N. Y.
Bugg, Wm., Consumers Material Corp., Kansas City, Mo.
Caldwell, A. B., Genesee Stone Products Co., Batavia, N. Y.
Callahan, J. R., Callahan Road Improvement Co., S. Bethlehem, N. Y.
Campbell, R. S., Holston Quarry Co., Knoxville, Tenn.
Cartwright, L. R., Mid-West Cr. Stone Co., Indianapolis, Ind.
Casparis, Kenneth E., Wis. Granite Co., Redgranite, Wis.
Clark, Claude L., Ohio Crushed Stone Ass'n, Columbus, O.
Clark, H. A., Consumers Co., Chicago, Ill.
Clark, Harvey N., Dolomite Co., Rochester, N. Y.
Chamberlain, Col., O. P., Dolese & Shepard Co., Chicago, Ill.
Collett, John, Midwest Crushed Stone Co., Ridgeville, Ind.
Cooke, J. H., The Lynn Sand & Stone Co., Hartford, Conn.
Cooke, Theo. C., Lynn Sand & Stone Co., Swampscott, Mass.
Cox, H. L., Anna Stone Co., Anna, Ill.
Croll, L. M., General Crushed Stone Co., Easton, Pa.
Crumm, Alvin E., France Stone Co., Toledo, O.
Cunningham, R. W., Canada Crushed Stone Corp., Ltd., Hamilton, Ontario.
Cushing, J. C., Cushing Stone Co., Inc., Schenectady, N. Y.
Cushing, J. E., Cushing Stone Co., Inc., Schenectady, N. Y.
Davies, Beulah M., N. C. S. A., Washington, D. C.
Doolittle, C. M., Canada Crushed Stone Corp., Ltd., Hamilton, Ontario.
Duff, W. W., Lake Erie Limestone, Youngstown, O.
Eames, Scott W., New Haven Trap Rock Co., New Haven, Conn.
Earnshaw, Fred O., The Carbon Limestone Co., Youngstown, O.
Enders, Fred, Louisville Cement Co., Speed, Ind.
Evans, Grace M., Monon Crushed Stone Co., Lafayette, Ind.
Evans, Edw. E., Whitehouse Stone Co., Toledo, O.
Eyermann, Wm. J., Eyermann Contracting Co., St. Louis, Mo.
Faylor, Ernest, General Crushed Stone Co., Glen Mills, Pa.
Faylor, Guy M., General Crushed Stone, Quakertown, Pa.
Foote, W. E., Wickwire Spencer Steel Corp., Gasport, N. Y.
Forman, P. G., Columbia Quarry Co., Valmeyer, Ill.
Fredericks, George J., Consolidated Stone & Sand Co., Montclair Heights, N. J.
Fredrick, H. N., France Stone Co., Logansport, Ind.
Frye, Wm. C., John T. Dyer Quarry Co., Norristown, Pa.
Gall, W. H. Jr., Wisconsin Granite Co., Chicago, Ill.
Gallagher, H. J., Wisconsin Granite Co., Sioux Falls, S. D.
Gaut, C. H., Holston Quarry Co., Mascot, Tenn.
Gilbert, Ellwood, New Castle Lime & Stone Co., New Castle, Pa.
Glassen, C. E., Columbia Quarry Co., Columbia, Ill.
Goldbeck, A. T., N. C. S. A., Washington, D. C.
Graves, Otho M., The General Crushed Stone Co., Easton, Pa.
Gray, Downey M., Louisville Cement Co., Louisville, Ky.
Greely, R. E., Greely Stone Co., St. Paul, Ind.
Gucker, F. T., The John T. Dyer Quarry Co., Norristown, Pa.
Haelig, W. H., Bound Brook Crushed Stone Co., Bound Brook, N. J.
Hammerschmidt, Geo. F., Elmhurst-Chicago Stone Co., Elmhurst, Ill.
Hammerschmidt, R., Elmhurst-Chicago Stone Co., Elmhurst, Ill.
Hart, George, Newton County Stone Co., Kentland, Ind.
Hartz, Geo. L., France Stone Co., Toledo, O.
Hawthorne, J. D., General Crushed Stone Co., Akron, N. Y.
Healey, Edward F., France Stone Co., South Bend, Ind.
Heimlich, W. R., Leroy Lime & Cr. St. Corp., Leroy, N. Y.
Heimlich, J. L., Leroy Lime & Cr. St. Corp., Leroy, N. Y.
Hendricks, E. D., Albany Crushed St. Corp., Albany, N. Y.
Henderson, D. H., Canada Crushed Stone Corp., Hamilton, Ontario, Canada.
Hickey, D. C., Rock Cut Stone Co., Syracuse, N. Y.
Higgins, Chas. V., Bound Brook Crushed Stone Co., Bound Brook, N. J.
Hipple, John A., Penn Lime St. & Cement Co., Lancaster, Pa.
Hitu, J. A., Villeray Quarry Co., Montreal, Canada.
Hodgkins, W. P., Brownell Improvement Co., Chicago, Ill.
Hooker, A. J., Buffalo Crushed Stone Co., Buffalo, N. Y.
Howe, F. M., Leroy Lime & Cr. Stone Corp., Leroy, N. Y.
Hubbert, T. C., T. C. Hubbert & Co., Inc., Wilmington, Del.
Immel, R. P., American Limestone Co., Mascot, Tenn.
Ireland, J. W., Lambertville Stone Quarry Co., Lambertville, N. J.
Jacoby, J. H., General Crushed Stone Co., Whitehaven, Pa.
Johnson, H. A., The Ohio Marble Co., Piqua, O.
Johnson, J. A., Bissemer Limestone & Cement Co., Youngstown, O.
Jones, Frank S., General Crushed Stone Co., Easton, Pa.
Junkin, Geo. B., John T. Dyer Co., Philadelphia, Pa.
Keever, W. J., Marble Cliff Quarries Co., Columbus, O.
Kelb, N. E., France Limestone Co., Indianapolis, Ind.
Keller, Bert, Dolese & Shepard Co., Chicago, Ill.
Kelley, A. William, Dyer Quarry Co., Birdsboro, Pa.
Kennedy, C. R., France Stone Co., Ft. Wayne, Ind.
King, J., The Carbon Limestone Co., Youngstown, O.
Kirkpatrick, L. W., Orange Quarry Co., West Orange, N. J.
Kirkpatrick, S. L., Orange Quarry Co., West Orange, N. J.
Knoblauch, C. G., National Lime & Stone Co., Findlay, O.
Klaus, C. E., Columbia Quarry Co., Columbia, Ill.
Kline, C. J., C. O., Hunsicker Cr. Stone Co., Allentown, Pa.
Krause, H. C., Columbia Quarry Co., St. Louis, Mo.
Krause, E. J., Columbia Quarry Co., St. Louis, Mo.
Kriege, Herbert F., The France Stone Co., Toledo, O.
Krumnacher, Marion, Nat'l Crushed Stone Ass'n, Easton, Pa.
Lanagan, Thomas A., General Crushed Stone Co., Winchester, Mass.
Lane, Arthur S., John S. Lane & Son, Inc., Meriden, Conn.
Lehr, E. B., C. O. Hunsicker Cr. Stone Co., Allentown, Pa.
Lott, Geo. D., Palmetto Quarries Co., Columbia, S. C.
Lunnsden, A. W., W. W. Boxley & Co., Pembroke, Va.
McCall, J. A., The Tarbox-McCall Stone Co., Findlay, O.
McGuire, J. A., Wisconsin Granite Co., Chicago, Ill.
McKeon, M. V., Gen'l Cr. Stone Co., Winchester, Mass.
McKinney, Bernard, West Roxbury Trap Rock Co., West Roxbury, Mass.
McLaughlin, F. F., Rock Cut Stone Co., Syracuse, N. Y.

McLean, Ralph E., East St. Louis Stone Co., E. St. Louis, Ill.
McMahon, E. J., St. Louis Quarrymen's Ass'n, St. Louis, Mo.
McMechan, David, Commonwealth Quarry Co., Summit, N.J.
Manchester, W. D., The Lynn Sand & Stone Co., Swampscott, Mass.
Margraf, W. H., Marble Cliff Quarries Co., Columbus, O.
Mohr, Wm., J. T. Dyer Co., Birdboro, Pa.
Monaghan, John C., Wis. Granite Co., Alexandria Bay, N. Y.
Moore, D. L., Leroy Lime & Cr. St. Corp., Springfield, N. Y.
Munson, Clarence A., New Haven Trap Rock Co., New Haven, Conn.
Murname, J. J., Mid West Cr. Stone Co., Greencastle, Ind.
Murphy, Grover J., Gen'l Cr. Stone Co., Little Falls, N. Y.
Murray, Maurice, John T. Dyer Co., Birdsboro, Pa.
Nagel, H., Erie Stone Co., Huntington, Ind.
Nettleton, Elwood T., Conn. Quarry Co., Inc., New Haven, Conn.
Nicholson, J. L., Cerulean Stone Co., Cerulean, Ky.
Odenbach, John H., Dolomite Prod. Co., Inc., Rochester, N. Y.
Ogden, I. A., Dittlinger Lime Co., New Braunfels, Texas.
O'Laughlin, C. J., A. C. O'Laughlin Co., Chicago, Ill.
Owens, A. S., Peerless Quarries, Inc., Utica, N. J.
Owens, I. G., Water Street Trap Rock Co., Water Street, Pa.
Owens, F. C., Rock Cut Stone Co., Auburn, N. Y.
Parson, Orville, The France Stone Co., Bluffton, Ind.
Patterson, Allen, National Lime & Stone Co., Findlay, O.
Patterson, Walter, Mid-West Cr. Stone Co., Ridgeville, Ind.
Paynter, W. B., Am. Stone Ballast Co., High Ridge, Ky.
Philips, Nick, The John T. Dyer Quarry Co., Birdsboro, Pa.
Pickett, D. S., Mid-West Crushed Stone Co., Spencer, Ind.
Poorman, Leo, The France Stone Co., Toledo, O.
Prichett, W. B., The John T. Dyer Quarry Co., Birdsboro, Pa.
Primley, Walter S., Wisconsin Granite Co., Chicago, Ill.
Quinn, Wm. F., Conn. Quarries Co., Inc., Rocky Hill, Conn.
Ragland, Edw. U., Raleigh Granite Co., Raleigh, N. C.
Rarey, Russell, Marble Cliff Quarries Co., Columbus, O.
Regan, Harry, Louisville Cement Co., Speed, Ind.
Reinhold, Paul B., Reinhold & Co., Inc., Pittsburgh, Pa.
Rex, B. P., General Crushed Stone Co., Easton, Pa.
Reynolds, Roy, Holston Quarry Co., Liberty, S. C.
Rhodes, J. F., Consumers Material Corp., Kansas City, Mo.
Rice, John, General Crushed Stone Co., Easton, Pa.
Rice, John Jr., General Crushed Stone Co., Easton, Pa.
Ripy, T. B., Kentucky Stone & Sand Co., Lawrenceburg, Ky.
Rippetoe, G. H., Anna Stone Co., Anna, Ill.
Robinson, H. O., Mass. Broken Stone Co., Greenfield, Mass.
Robinson, Lawrence, Greenfield Broken Stone Co., Greenfield, Mass.
Robinson, Ralph M., John S. Lane & Son, Inc., Meriden, Conn.
Rodes, H. E., Franklin Limestone Co., Nashville, Tenn.
Savage, Arthur S., Buffalo Crushed Stone Co., Buffalo, N.Y.
Savage, James, Buffalo Crushed Stone Co., Buffalo, N. Y.
Schaefer, Geo. E., General Cr. Stone Co., Rochester, N. Y.
Schaub, H. W., France Stone Co., Toledo, O.
Schmalz, Alban, Eyermann Contracting Co., St. Louis, Mo.
Schmidt, F. W. Jr., No. Jersey Quarry Co., Morristown, N. J.
Schmidt, John H., No. Jersey Quarry Co., Morristown, N.J.
Schoonover, Harold, Louisville Cement Co., Speed, Ind.
Schroeder, J. F., Linwood Cement Co., Davenport, Iowa.
Schwartz, Harry, John T. Dyer Co., Birdsboro, Pa.
Scott, A. L., General Crushed Stone Co., Leroy, N. Y.
Seitz, A. G., Rock Cut Stone Co., Syracuse, N. Y.
Sharp, H. M., The France Co., Toledo, O.
Shauck, Ruth E., N. C. S. A., Washington, D. C.
Sheridan, E. D., Chico Stone Products Co., Chico, Texas.
Sloan, Frank A., Universal Granite Quar. Co., Chicago, Ill.
Sloan, V. I., Universal Granite Quarries Co., Chicago, Ill.
Smith, Albert, Gen'l Crushed Stone Co., Port Deposit, Md.
Snodgrass, E. A., Louisville Cement Co., Speed, Ind.
Souders, Earl G., The John T. Dyer Quarry Co., Morristown, Pa.
Sporborg, W. L., Rock Cut Stone Co., Syracuse, N. Y.
Sparks, W. C., Cedar Bluff Quarry Co., Princeton, Ky.
Stelzer, W. A., France Quarries Co., Urbana, O.
Stephens, Fred J., The John T. Dyer Quarry Co., Mt. Penn., Pa.
Stone, W. E., Ohio Marble Co., Piqua, O.
Stull, John W., Rocky Point, Va.
Taff, Fred, Morris Crushed Stone Co., Millington, N. J.
Tarbox, Harry, Tarbox-McCall Stone Co., Findlay, O.
Taylor, E. B., Midwest Crushed Stone Co., Greencastle, Ind.
Tielker, E. H., France Stone Co., Toledo, O.
Tyler, R. B., R. B. Tyler Co., Louisville, Ky.
Ward, C. D., The France Quarries Co., Indianapolis, Ind.
Ward, M. R., Toledo Stone & Glass Sand Co., Toledo, O.
Watson, D. R., Canada Crushed Stone Co., Hamilton, Ont.
Weaver, F. E., France Stone Co., Greencastle, Ind.
Weber, J. E., Casper Stolle Quarry & Contracting Co., East St. Louis, Ill.
Weiman, Walter, Rock Cut Stone Co., Auburn, N. Y.
Weston, T. I., The Western & Brooker Co., Columbia, S. C.
Wilson, A. R., Granite Rock Co., Watsonville, Calif.
Wise, W. F., Stringtown Cr. Rock Co., San Antonio, Tex.
Wiske, Wm., Wisconsin Granite Co., Chicago, Ill.
Worthen, A. L., Connecticut Quarries Co., New Haven, Conn.
Wortman, I. W., North Jersey Quarry Co., Morristown, N. J.
Yambert, D. W., The France Stone Co., Toledo, Ohio.
Yotter, H. F., General Crushed Stone Co., Easton, Pa.

## Associate Members

Adamson, C. H., Stephens-Adamson Mfg. Co., Aurora, Ill.
Ahl, John C., E. I. duPont deNemours & Co., Lima, O.
Allen, W. T., Keystone Lubricating Co., Indianapolis, Ind.
Anderson, Wm. A., Hercules Powder Co., Buffalo, N. Y.
Andrews, C. B., Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Ashcraft, H. G., Union Explosives Co., Clarksburg, W. Va.
Austin, W. J., Hercules Powder Co., Chicago, Ill.
Averill, J. L., Davis & Averill, Inc., Newark, N. J.
Bakstad, J. R., Bakstad Cr. & Equip. Corp., Chicago, Ill.
Baldwin, M. H., Burrell Eng. & Const. Co., Chicago, Ill.
Barab, J., Hercules Powder Co., Wilmington, Del.
Barret, Thomas L., Armstrong Mfg. Co., Louisville, Ky.
Bassler, A. H., Illinois Powder Mfg. Co., St. Louis, Mo.
Becker, Ralph C., McGraw-Hill Cat. & Direc. Co., N. Y. C.
Beebe, Lucius, Troco Lubricating Co., Philadelphia, Pa.
Behmer, F. A., Jeffery Mfg. Co., Columbus, O.
Bell, Burton J., American Tar Products Co., Pittsburgh, Pa.
Berguson, Vic., Keystone Lubricating Co., Pittsburgh, Pa.
Bisch, James L., Atlas Powder Co., Wilmington, Del.
Blackburn, D. M., Hendricks Mfg. Co., Carbondale, Pa.
Bond, J. S., Allis Chalmers Mfg. Co., West Allis, Wis.
Bowman, Chas. H., Trojan Powder Co., Chicago, Ill.
Brandon, J. K., Ensign Bickford Co., Simbury, Conn.
Broan, William Ingersoll-Rand Co., Chicago, Ill.
Brodhead, R., Hercules Powder Co., Madison, Wis.
Burrell, G. T. Jr., Burrell Engr. & Const. Co., Chicago, Ill.
Burrell, T. L., Burrell Engine Ring & Con. Co., Chicago, Ill.
Cary, Sheldon, Browning Crane Co., Cleveland, O.
Caskey, R. E., Atlas Powder Co., St. Louis, Mo.
Cheney, Darrol L., Marion Steam Shovel Co., Buffalo, N. Y.
Colby, A. C., Symons Bros. Co., Chicago, Ill.
Conant, R. W., Bucyrus-Erie Co., New York City.
Conley, Herbert H., Union Explosive Co., Leroy, N. Y.
Cox, H. L., Marion Steam Shovel Co., Philadelphia, Pa.

Crain, Allan M., The Orville Simpson Co., Cincinnati, O.
Crawford, Harry G., Allis-Chalmers Mfg. Co., Indianapolis, Ind.
Crew, J. B., Marion Steam Shovel Co., Chicago, Ill.
Crumbaugh, Jno. J., Caterpillar Tractor Co., Peoria, Ill.
Davis, Grant, Marion Steam Shovel Co., Marion, O.
Davis, W. C., Atlas Power Co., Wilkes-Barre, Pa.
Davison, H. M., The Hayward Co., New York.
De Hart, Henry P., W. S. Tyler Co., Norwood, O.
Dunn, W. O., Grasselli Powder Co., Cleveland, O.
Enochs, J. H., Harnischfeger Corp., Milwaukee, Wis.
Ellsworth, S. S., The Ensign-Bickford Co., Simsbury, Conn.
Escher, E. P., Stephens-Adamson Mfg. Co., Detroit, Mich.
Files, R. T., Blaw Knox Co., Pittsburgh, Pa.
Fitzgerald, Jas. S., Flexible Steel Lacing Co., Columbus, O.
Flounders, G. W., C. G. Buchanan Co., New York City.
Fraunfelder, Geo., Easton Car & Const. Co., Easton, Pa.
Freeland, T. S., Thew Shovel Co., Baltimore, Md.
Gainty, W. F., Hercules Powder Co., Chicago, Ill.
Garber, M. B., Thew Shovel Co., Lorain, O.
Gard, Edgar F., Trojan Powder Co., Chattanooga, Tenn.
Geither, Edward C., Ingersoll Rand Co., Chicago, Ill.
Gill, Fred A., Gill Rock Drill Co., Lebanon, Pa.
Goldberg, Abe, Allis Chalmers Mfg. Co., West Allis, Wis.
Gracely, Harvey T., Marion Steam Shovel Co., Marion, O.
Graham, R. B., Graham Coal Co., Philadelphia, Pa.
Gramer, Geo. W., Flexible Steel Lacing Co., Chicago, Ill.
Greensfelder, N. S., Hercules Powder Co., Wilmington, Del.
Hale, Chas. C., The Loomis Machine Co., Tiffin, O.
Heath, E. W., The Fate-Root-Heath Co., Plymouth, O.
Heisey, P. B., Bucyrus-Erie Co., Pittsburgh, Pa.
Henson, Thos. F., Marion Steam Shovel Co., New York City.
Heppler, William A., Hewitt-Gutter Percha Rubber Corp., Chicago, Ill.
Hodge, S. C., Niagara Concrete Mixer Co., New York City.
Hopkins, H. E., Cement, Mill & Quarry, Chicago, Ill.
Horlick, J. R. Jr., Hercules Powder Co., Wilmington, Del.
Howser, C. M., The Marion Steam Shovel Co., Marion, O.
Hubbard, K. B., Good Roads Machinery Co., Chicago, Ill.
Hudson, L. D., Symons Bros. Co., New York City.
Hughes, A. D., Trojan Powder Co., Allentown, Pa.
Jobson, Geo. J., Kennedy Van Saun Mfg. Eng. Corp., N.Y.C.
Johann, H. A., Frog Switch & Mfg. Co., Chicago, Ill.
Johnson, J. M., Allis Chalmers Mfg. Co., Chicago, Ill.
Johnson, S. Arthur, Hercules Powder Co., New York City.
Jones, L. B., The Browning Crane Co., Cleveland, O.
Jones, L. W., Manganese Steel Forge Co., Philadelphia, Pa.
Kantenwein, O. E., Koppel Ind. Car & Equip. Co., Chicago.
Keane, L., Hercules Powder Co., Columbus, O.
Kegg, W. Boyd, McGraw-Hill Cat. & Direc. Co., Cleveland, Ohio.
Keine, W. E., Allis-Chalmers Mfg. Co., New York City.
Kincaid, M. S., The Grasselli Powder Co., St. Louis, Mo.
King, Arthur, Vulcan Iron Works, St. Louis, Mo.
King, H. C., Hercules Powder Co., Waterville, O.
Lambert, Max S., Robins Conveying Belt Co., Chicago, Ill.
Lewis, E. G., Bucyrus Co., New York City.
Long, J. Edgar, Union Explosives Co., Clarksburg, W. Va.
Loughry, J. B., The Thew Shovel Co., Chicago, Ill.
MacBlain, John, Grasselli Powder Co., Cleveland, O.
MacDonald, J. M., Atlas Powder Co., Allentown, Pa.
MacFayden, L. E., Taylor Wharton Iron & Steel Co., Philadelphia, Pa.
MacKenzie, Donald F., Trojan Powder Co., Allentown, Pa.
Malsherger, A. H., E. I. DuPont de Nemours & Co., Springfield, Ill.
Marshall, W. B., Chain Belt Co. (Stearns Conveyor Co.) Milwaukee, Wis.
Martin, Geo. E., The Barrett Co., New York City.
MacDowell, W. C., Traylor Engr. & Mfg. Co., Allentown, Pa.
McKee, L. L., National Malleable Steel Co., Cleveland, O.
McKnight, L. B., Stearns Conveyor Co., Cleveland, O.
Mellin, Arthur A., Atlas Powder Co., Columbus, O.
Mullally, W. S., Am. Manganese Steel Co., Chicago Hts., Ill.
Munday, H. W., Pit and Quarry, Chicago, Ill.
Nelson, S. M., E. I. duPont de Nemours & Co., Chicago, Ill.
Newton, Harry W., The Dorr Co., Chicago, Ill.
Nicol, W. S., Cross Engineering Co., Carbondale, Pa.
Niesen, O. B., Trojan Powder Co., Allentown, Pa.
Nothacker, W. F., Sanderson Cyclone Drill Co., New York.
O'Brien, J. F., Vulcan Iron Works, Wilkes-Barre, Pa.
O'Neill, James J., Hercules Powder Co., Wilmington, Del.
O'Neill, W. D., Buffalo Wire Works Co., Buffalo, N. Y.
Owen, A. E., Niagara Concrete Mixer Co., Cleveland, O.
Parsons, C. E., Kennedy-Van Saun Mfg. Co., New York City.
Patton, E. J., Stephens-Adamson Mfg. Co., Aurora, Ill.
Pement, F. A., Sauerman Bros., Inc., Chicago, Ill.
Pfoutz, C. Y., The Dorr Co., Chicago, Ill.
Philipp, P. C., Burrell Engr. & Const. Co., Chicago, Ill.
Phillips, Chester A., The Osgood Co., Chicago, Ill.
Philips, Earle S., The Good Roads Machinery Co., Kennett Square, Pa.
Phillips, W. W., The Grasselli Powder Co., Cleveland, O.
Pietsch, W. Vincent, Earle C. Bacon, Inc., New York.
Piggott, J. Wallace, W. S. Tyler Co., Cleveland, O.
Pilgrim, E. W., General Electric Co., Schenectady, N. Y.
Poorman, J. D., Trojan Powder Co., Chicago, Ill.
Pringle, W. Dick, The W. S. Tyler Co., Cleveland, O.
Potter, W. H., Manganese Steel Forge Co., Chicago, Ill.
Redman, H. W., Keppel Indus. Car & Equip. Co., Chicago.
Ridenour, L. N., P. & H. Co., Milwaukee, Wis.
Riggs, C. A., The Loomis Machine Co., Tiffin, O.
Robins, Morgan E., Robins Conveying Belt Co., New York.
Robins, S. D., Robins Conveying Belt Co., New York City.
Robinson, J. B., General Electric Co., Elmhurst, Ill.
Rockwood, N. C., Rock Products, Chicago, Ill.
Root, Ralph R., Nat'l Mal'ble & Steel Cast. Co., Cleveland, O.
Ruddy, T. A., Stephens-Adamson Mfg. Co., Chicago, Ill.
Runkle, K. H., General Electric Co., Schenectady, N. Y.
Russell, S. R., E. I. duPont de Nemours & Co., Wilmington, Del.
Ryan, R., Marion Steam Shovel Co., Chicago, Ill.
Ryder, H. C., The Hayward Co., New York City.
Schermer, F. J., Armstrong Mfg. Co., Waterloo, Iowa.
Schirmer, G., Blaw-Knox Co., Blawnox, Pa.
Schneider, Ray F., Williams Patent Crusher & Pulv. Co., St. Louis, Mo.
Shaw, Edmund, Rock Products, Chicago, Ill.
Sheehan, W. J., The Osgood Co., Chicago, Ill.
Shield, W. L., Peerless Explosives Co., Wilkes-Barre, Pa.
Shoemaker, A. J., duPont de Nemours & Co., Wilmington, Del.
Shotton, B. G., Hendrick Mfg. Co., Pittsburgh, Pa.
Shugg, L. W., General Electric Co., Schenectady, N. Y.
Simmons, E. B., Rinek Cordage Co., Easton, Pa.
Simpson, Lowe, The Orville Simpson Co., Cincinnati, O.
Sittig, A. R., Am. Manganese Steel Co., Chicago Hts. Ill.
Slider, Walter, E. T. Slider, New Albany, Ind.
Sloss, James, Keystone Lubricating Co., St. Louis, Mo.
Smith, B. Frank, Bucyrus-Erie Co., Pittsburgh, Pa.
Smith, J. H., Atlas Powder Co., Wilmington, Del.
Snelling, Walter O., Trojan Powder Co., Allentown, Pa.
Srodes, H. B., Trojan Powder Co., Bucyrus, O.
Sullivan, Ralph C., Rock Products, Chicago, Ill.
Summer, R. H., E. I. duPont de Nemours & Co., St. Louis, Mo.
Swabb, Frank L., Heisler Locomotive Works, Erie, Pa.
Thistlewaite, J. M., Symons Bros. Co., Chicago, Ill.
Tindall, J. W., Atlas Powder Co., Vincennes, Ind.
Tompkins, G. H., Sauerman Bros., Inc., Chicago, Ill.
Walker, Lloyd, Smith Engineering Works, Boston, Mass.
Walsh, Wm. J., Armstrong Mfg. Co., Waterloo, Iowa.
Warren, Jeffery Mfg. Co., Columbus, O.

Wells, J. M., Ingersoll Rand Co., New York City.
Westhaver, John LeRoy, Niagara Concrete Mixer Co., La Grange, Ill.
Wettlaufer, E. L., Niagara Con. Mixer Co., Toronto, Can.
Wettlaufer, W. L., Niagara Con. Mixer Co., Buffalo, N. Y.
Wigton, Paul, Traylor Vibrator Co., Denver, Colo.
Wilson, E. R., Marion Steam Shovel Co., Marion, O.
Withey, M. W., Trojan Powder Co., Chicago, Ill.
Wood, C. E., Pit and Quarry, Chicago, Ill.
Wolf, Edwin T., E. I. duPont de Nemours & Co., Narberth, Pa.
Woodhull, M. J., Bucyrus-Erie Co., Chicago, Ill.
Wyse, F. O., Bucyrus-Erie Co., Milwaukee, Wis.
Yerker, Jos. H., Keystone Lubricating Co., St. Louis, Mo.
Young, William R., Earle C. Bacon, Inc., New York.

## Guests

Adams, W. W., U. S. Bureau of Mines, Washington, D. C.
Allen, W. D., Fairmont Mining Machinery Co., Wilkinsburg, Pa.
Angle, S. P., Hagerstown, Md.
Averill, Ruth Y., Newark, N. J.
Badollet, R. P., Baltimore & Ohio R. R., Springfield, Ill.
Bair, Mrs. H. E., Toledo, O.
Cahill, Edwin H., Providence, R. I.
Cartwright, Mrs. L. R., Mid-West Cr. Stone Co., Indianapolis, Ind.
Bauer, E. C., Kensington Steel Co., Chicago, Ill.
Bear, Firman E., Ohio State University, Columbus, O.
Blake, R. P., Independence Bureau, Philadelphia, Pa.
Brosseau, Mack Trucks, Inc., New York City.
Cartwright, E. R., Mid-West Cr. Stone Co., Indianapolis, Ind.
Casparis, Mrs. L. L., Redgranite, Wis.
Claussen, Theodore, Asphalt Concrete Corp., New York City.
Colgan, F. J., Colgan Limestone Products Co., Columbus, O.
Colgan, Mrs. F. J., Columbus, O.
Conner, C. N., Highway Research Board, National Research Council, Washington, D. C.
Davis, Mrs. Grant, Marion, O.
DeHart, Mrs. H. P., Norwood, O.
Devlin, John T., Manning, Maxwell & More, Inc., New York
Dickerson, N. K., R. B. Tyler Co., Louisville, Ky.
Drainey, J. R., Natural Rock Asphalt Corp., Louisville, Ky.
Earnshaw, Mrs. Fred O., Youngstown, O.
Fowlkes, Sam, Convention Bureau, New Orleans, La.
Freeman, P. J., Allegheny County D.P.W., Pittsburgh, Pa.
Galagher, Mrs. H. J., Sioux Falls, S. D.
Greely, Mrs. R. E., Indianapolis, Ind.
Hartzell, H. O., Baltimore & Ohio R. R., Baltimore, Md.
Hinkle, A. H., Ind. State Highway Dept., Indianapolis, Ind.
Hinkle, Mrs. A. H., Indianapolis, Ind.
Hodgin, C. N., Kokomo Stone Co., Kokomo, Ind.
Hopkins, Mrs. H. E., Chicago, Ill.
Hulbert, Mrs. T. C., Wilmington, Del.
Ireland, Mrs. J. W., Lambertville, N. J.
Johann, Mrs. A. A., Chicago, Ill.
Johnston, Mrs. H. A., Ohio Marble Co., Piqua, O.
Keefer, W. Dean, Nat'l Safety Council, Chicago, Ill.
Keeth, J., East Liberty Stone Co., East Liberty, O.
Kersey, P. A., U. S. Bur. of Public Rds., Washington, D. C.
Lacy, W. T., U. S. Bureau of Mines, Pittsburgh, Pa.
Ladd, Geo. E., U. S. Bureau of Public Roads, Wash., D. C.
Lane, Mrs. A. S., Meriden, Conn.
Leduc, Francoes J., Montreal, Que.
Lents, Frank, Loogootee, Ind.
Lunnsden, Mrs. A. W., Pembroke, Va.
Margraf, Mrs. W. H., Columbus, O.
Matthews, W. J., Chicago, Ill.
Mattimore, H. S., Harrisburg, Pa.
McCall, Mrs. J. A., Findlay, O.
McLean, Mrs. R. E., East St. Louis, Ill.
Miesenhelder, P. D., Indiana State Highway Commission, Indianapolis, Ind.
Monaghan, Mrs. John C., Alexandria Bay, N. Y.
Montague, Gilbert H., New York City.
Mumford, F. L., C. C. C. & St. L. Ry. Co., Indianapolis, Ind.
Munsch, Albert A., U. S. Bureau of Mines, Pittsburgh, Pa.
Murphy, F. C., Electric Limestone Co., St. Louis, Mo.
Neubert, J. V., New York Central R. R., New York City.
Nolan, S. Frank, Providence, R. I.
Pickett, Mrs. D. S., Spencer, Ind.
Riggs, Chas. H., Monon Route, West Baden, Ind.
Runyon, Chas., Shoals, Ind.
Savage, Mrs. Arthur S., Buffalo, N. Y.
Scallon, E. P., Quinn Stone & Ore Co., Ltd., Ironton, Minn.
Schirmer, Mrs. G., Harvey, Ill.
Seaverns, James B., James B. Seaverns Co., Batavia, Ill.
Sharp, Mrs. H. M., Toledo, O.
Shoemaker, Mrs. A. J., Chicago, Ill.
Slider, E. T., E. T. Slider Co., New Albany, Ind.
Sloan, Mrs. V. I., Chicago, Ill.
Sparks, Mrs. W. C., Princeton, Ky.
Stegall, R. S., U. S. Bureau of Mines, Charleston, W. Va.
Swartley, H. R. Jr., Asphalto Concrete Corp., New York City
Tarbox, Mrs. H. L., Findlay, O.
Thistlewaite, Mrs. J. M., Sheridan, Ind.
Theenen, J. R., U. S. Bureau of Mines, New Brunswick, N.J.
Tyson, J. R., Bethlehem Mines Corp., Bethlehem, Pa.
Ward, Mrs. C. D., Indianapolis, Ind.
Weber, Mrs. J. E., Casper Stolle Quarry & Const. Co., East St. Louis, Ill.
Weitknecht, Wm. H., Lehigh Portland Cement Co., Mitchell, Ind.
Wellington, A. J., Mass. Broken Stone Co., Newton, Mass.
West, W. C., West Process Pavement Co., Louisville, Ky.
Young, C. M., Cincinnati Rubber Mfg. Co., Cincinnati, O.

## Constitution of Portland Cement

Powdered clinker removes 63% of naphthalene acids from solution in benzine. The phenomenon does not appear to be adsorption. Calcium salts of the naphthalene acids were extracted by ether and proved soluble in benzine. The absorption of naphthalene acids increases with the degree of dispersion of the clinker, that is, when the lime is evenly distributed throughout its mass. The addition of naphthalene acids to cement results in the formation of films of calcium soaps insoluble in water, which prevent the latter from coming into contact with lime. The reaction is probably wholly molecular. I. Aleksandrov. (Jour. Russ. Phys. Chem. Soc. 58, 1362, and C. A., Jan. 10, 1928).

## Stone from Blast Furnace Slag

Slag from iron foundries and hematite blast furnaces as well as basic slags from steel furnaces may be used for the production of artificial stone in the following manner. They are ground in mills to a fine powder with sufficient water to form a plastic mass, during which operation ammonia and hydrogen sulphide are evolved. Hydrolysis of some constituents occur and the ground mass sets and hardens like cement. The mass is mixed with sandy slag and a small amount of cement, pressed into blocks which are allowed to harden for 8-10 weeks.

# STRIPPING PROBLEMS VARY IN SAME DISTRICT IN SOUTHERN INDIANA

DOWN in Southern Indiana is a district between and around Bedford and Bloomington which has attained an outstanding position in the building field for its Indiana limestone. This cut building stone has been shipped into every state in the Union for use in a long list of the most important buildings in the country. The stone is an oolitic limestone.

The oolitic limestone between Bedford and Bloomington is under four distinct strata. First is the layer of topsoil and clay; second a mixture of clay and "spawls"; third a layer of Mitchell limestone, a hard, flintlike, blue stone; and fourth a layer of soapstone. Each of these varies in thickness from a few inches to several feet. In the Sanders district, south of Bloomington, the total overburden runs as high as 70 feet, while in parts of the Hunter Valley district, north of Bloomington, the soapstone and Mitchell limestone are absent and the oolitic stone lies under a layer of about four feet of topsoil and clay, and a couple of feet of spawls.

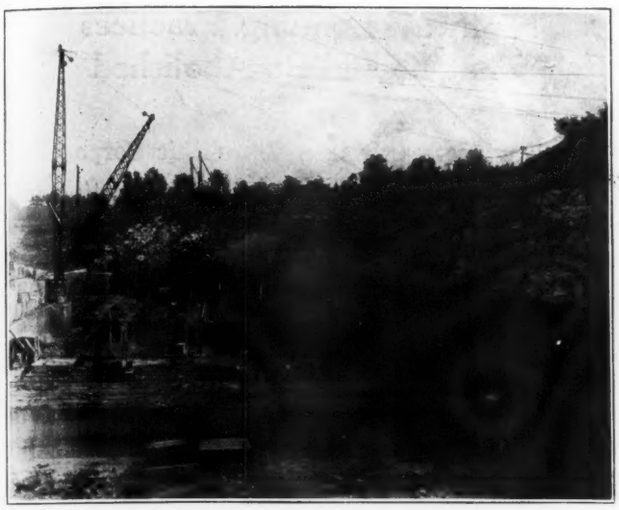
In the removal of the topsoil and clay and the layer of spawls, hydraulic stripping is frequently used. Where the soil and clay is loose, or reasonably so, you can shoot a stream of water from the one-inch nozzle on it, and it will bite and dig away this soil at a rate that would astonish the old time stripping contractor. A half an acre area four or five feet thick can be stripped in two or three weeks. The Universal Hydraulic nozzle is most generally used to take off the topsoil and clay, then the other layers down to the oolitic stone are drilled and shot, and this debris removed by steam shovels.

The water supply is not a problem, in most cases. It is there in abundance, in the old quarry holes. The spillway usually drains back into the old hole, the water being used over and over again. The cost of stripping per yard, the yardage per hour, the exact cost as compared to team stripping or steam shovel, are difficult to obtain because of varying conditions. No two quarries present the same problems.

Illustrating the fact that practically every quarry here presents a different set of conditions, there's the Sanders quarry of the Chicago-Bloomington Stone Company. Their stripping work is done with shovels—a Bucyrus 1¾ yard electric, 50-B, and a 1 yard Northwest gasoline shovel. This company also operates a quarry in the Hunter Valley district, where a hydraulic stripping outfit has been used with marked success. Here, there's a topsoil of four to five feet, a five foot layer of spawls, and a three foot stratum of Mitchell limestone.

The overburden at the Sanders quarry is taken off in two lifts. The Indiana limestone or building stone underlying the stripping is one solid mass some sixty-five feet thick. On top of this is a layer

A Typical Scene In the Bedford Bloomington District Showing a Dump Heap nad Stock Pile at the Sanders Quarry.



A General View of the Sanders Quarry.

of shale which runs about ten feet in depth. The remaining overburden above this runs about twenty-five or thirty feet in depth. Since all the overburden, with the exception of the four or five feet of top soil, is heavy rock and shale, it requires no small amount of blasting. The ten feet of shale immediately above the limestone is taken off separately. The reason for this is that most of the heavy blasting of overburden is above this, this ten feet of shale being left to the last to deaden the effect of the shots. This is necessary because the Indiana limestone is more or less subject to fracture unless precaution is taken.

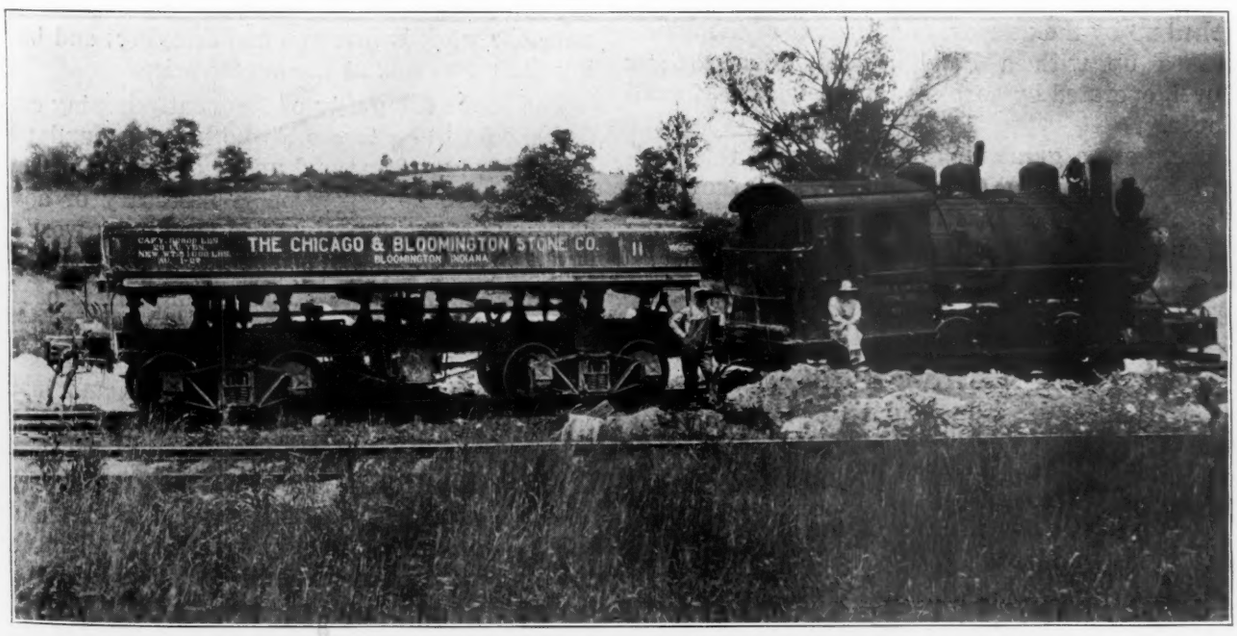
The larger shovel is used on the upper strata of overburden, because it is the heavier and more difficult task. This material is drilled for shooting by Clipper drills. After a blast the machine digs in and moves about 800 or 900 yards of material in a 10-hour day. Every effort possible is made to clean up the overburden perfectly, and prevent injury to the limestone, rather than make a high daily yardage. It frequently happens, for instance, that they do not operate a full day, and on some days both shovels may be entirely idle.

The smaller shovel works down on the ten-foot ledge of shale. This shovel serves as a clean-up machine. In shooting this shale, they endeavor to break it up in pieces running from 20 to 30 tons in weight. The large pieces are then handled by a 40-ton derrick having a 115-foot mast and 100-foot boom. This derrick simply dumps these large pieces into quarry holes from which the building stone has all been taken. After this large stuff is removed the small machine cleans up the remainder, handling from 50 to 600 yards per day.

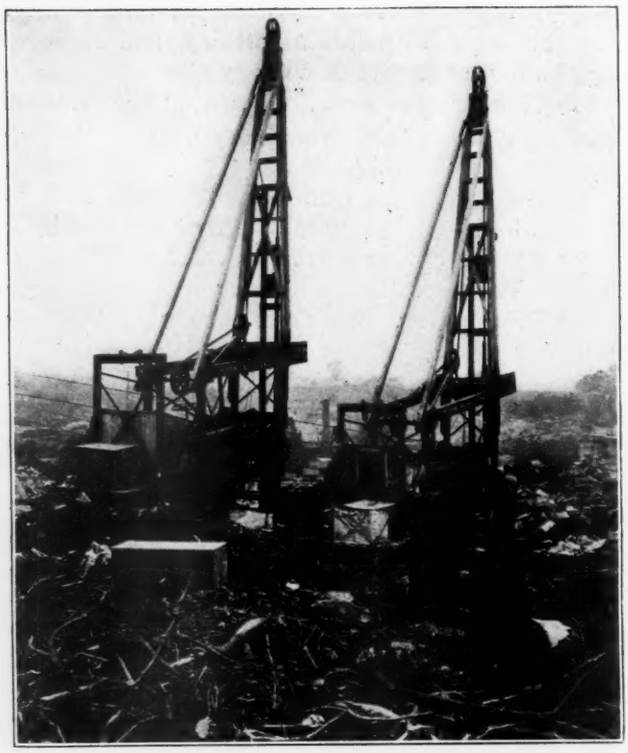
All the overburden is considered as waste and is not utilized for any purpose. A Western side-dump car, 20 yards capacity, pulled by a locomotive, is used to haul the debris to the dumpheap, a switch being run alongside the ledge for that purpose. Serving the Bucyrus machine they use a 40-yard Clark Car Company all-steel car. With this type car the side opens down and out and serves as an apron. This type of car is necessary because so much of the stuff handled would not go through the ordinary type of dump car where the side raises.

At the quarry in the Hunter Valley district operated by the Chicago Bloomington Stone Company different conditions prevail as was mentioned. Here an unusually long pipe line is used—1,700 feet. This was necessary because it is a new ledge, opened a few months ago, and the nearest water supply was 1,700 feet away. A 150 h. p. Allis-Chalmers motor is used, with a four-stage Morse pump. A five-inch pipe line is used all the way, except for a four-inch connection at the nozzle. This outfit was installed and started operating in January, 1927.

Before that time, teams and scrapers were used.




Showing Method of Transportation at Sanders Quarry.



Well Drills Are Very Generally Seen.

While expensive, the cost was not prohibitive in this case because of the thin topsoil. However, George Miller, foreman, has figured the cost of stripping at 50 cents a yard, and hydraulic stripping with the new outfit at 8 to 10 cents a yard. A Universal nozzle with one-inch tip is used. Sometimes when more volume is required to wash loose dirt, a 1½ inch tip is used.

Two men operate the nozzle and one man is on duty at the pump. Operating costs for labor are $20 for a 10-hour day, and for power about $12, making a total operating cost of about $32 a day. When the dirt is removed, the stratum of Mitchell limestone is drilled and shot. Large chunks are picked up by the derrick, and the rest of the debris cleaned up with a Pawling and Harnischfeger shovel, operated by gasoline motor, with a ¾ yard dipper.

There are a great many operations in this Bedford Bloomington District and some of the other operations were discussed in the August 17, 1927, Pit and Quarry. This issue carried an article featuring the hydraulic stripping problems particularly.

## Early High Strength Concrete

(1) Decrease the usual amount of mixing water generally used; (2) one-half gallon of this water is replaced by one-half gallon calcium chloride solution (1 of salt to 2 of water by volume); (3) increase the mixing time as long as possible, up to 5 minutes; (4) place the concrete at 70 degrees F. and keep it so for two or three days; (5) Keep the concrete moist during curing.

J. S. Lain (Conc. & Con. Eng. December, 1927).

## Highway Bonding Practices That Should Be Abolished

By A. R. Hirst*
Chief Engineer, American Vibrolithic Corporation

Practices of bonding companies in accepting unreliable and unsatisfactory contractors reduces the business from that of a suretyship to a collection agency business. All plans for improving contracting conditions have as a basic idea the elimination of the unskilled and foolish bidders. One plan is to create a central rating bureau to be maintained by the bonding companies. Contractors would justify their right to be bonded by filing full certified information with the bureau. That plan would be autocratic, costly and worthless as information filed today may be worthless tomorrow. No form of questionnaire will reduce incompetency.

The program of highway building involves the following participants: The public, the governors and legislatures, the newspapers, highway officials, including their engineers, contractors, bonding companies, banks, manufacturers and dealers in highway materials, machinery and supplies. In the background, influencing each of these factors, is the great American game of politics.

The contractors are guilty of being highway builders when good judgment would indicate some more appreciated form of philanthropy; of bidding without due consideration; and of getting bonds, money, machinery, materials and supplies from institutions which are guilty of encouraging bids by absolutely low and incompetent contractors.

The bonding companies are guilty of bonding anyone who can show that he or his associates can pay any losses; of furnishing bid bonds or certified checks to all who can stand the probable losses; of introducing new competition into a crowded field; of paying too little attention to slipping contractors until the work is involved and delaying; and bonding the worst risk at the lowest price.

The banks are guilty of frequently issuing certified checks to contractors who have no funds; encouraging new firms and undue expansion of small firms, where no expansion is necessary or advisable; and granting unjustified credits on work.

We would suggest that we have concerted action to eliminate all lien laws, protecting sellers of machinery, materials and supplies; to secure the inclusion of severe penalties for delays and large bonuses for speed in all specifications and insure their enforcement; select certain bonding companies which will not bond incompetents, will show their books annually and share the profits; eliminate bid bonds and certified checks not backed by the bidders cash; refuse patronage to all institutions which encourage unfair competition by the ignorant and incompetent.

*Abstract of paper delivered before the American Road Congress, Cleveland, Ohio, Jan. 11, 1928.

# ANALYSIS OF RELATIVE VALUES OF VARIOUS VIBRATING SCREENS

By D. W. Yambert
Mechanical and Electrical Engineer, France Stone Company*

DEVELOPMENT during the past few years of various types of vibrator screens now on the market has aroused much interest among stone producers. There seems, however, to be no definite generally accepted opinion as to which type is the nearest to perfection. In fact, the several manufacturers have conflicting opinions as to the advantage or disadvantage of certain particular features. For instance, one manufacturer will claim that the screen cloth must whip and another states whipping must be carefully avoided; and one will claim a rotary vibration to be a great advantage while another says that this motion rubs the cloth and decreases cloth life.

It, therefore, is still quite a puzzle to the quarryman to draw a definite conclusion unless he experiments with a few of the most radically differing types and arrives at a conclusion from actual experience.

It has been my pleasure to have some experience with and to make a study of several types and makes of vibrator screens and it will be my purpose in this paper to discuss briefly the features of these several screens, pointing out the apparent trend of design, and offering some personal opinions as to the functions of vibratory screens.

Roughly vibrator screens can be divided into the following four classes according to the means of imparting the vibration to the screen cloth:

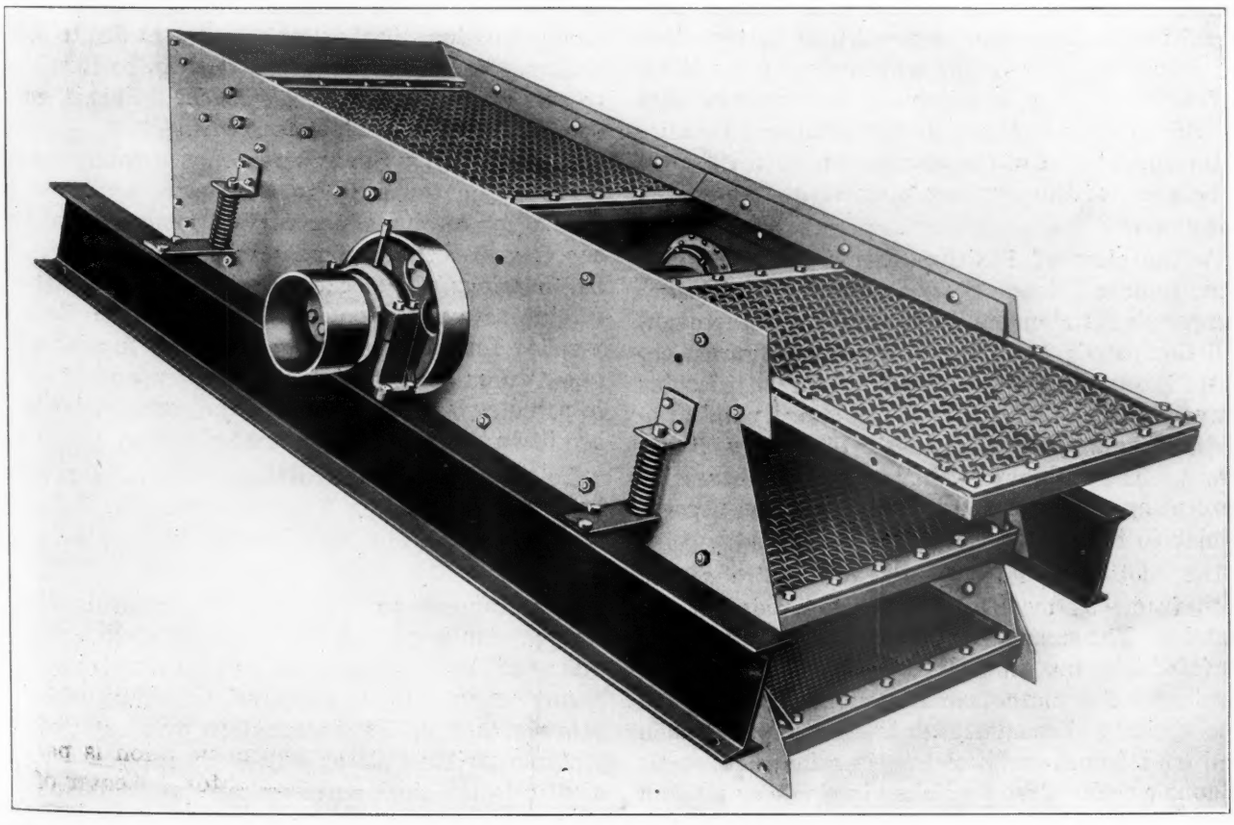
1. Rotating unbalanced weights.
2. Positive throw eccentrics.
3. Electro magnets.
4. Cam or bumper.

To the class of Rotating unbalanced weights belongs Robins Conveying Belt Company's Vibrex screen; Link-Belt Company's vibrating screen and Universal Vibrating Screen Company's Universal screen.

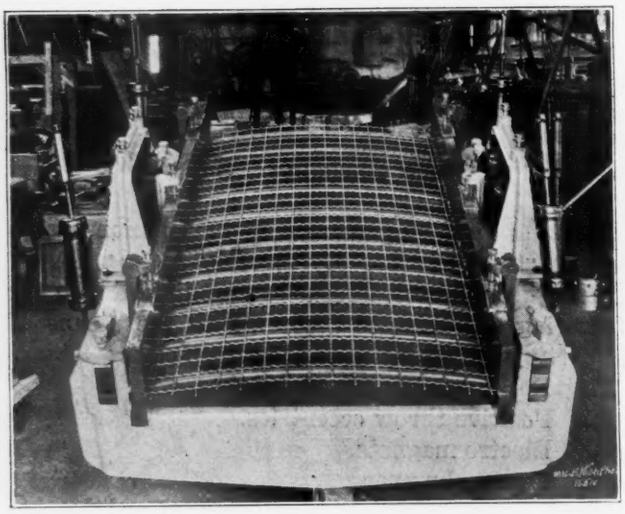
The Robins Vibrex Screen has a rotary vibratory motion imparted to the entire screen cloth frame by means of adjustable unbalanced revolving weights which are mounted on a belt driven shaft running in dust tight Timken roller bearings at 1,800 r. p. m. One h. p. is required. The cloth is tightened on the cloth frame through 10 adjustable coil springs.

The Link-Belt screen has a rotary vibratory motion imparted to the entire screen cloth frame by means of adjustable unbalanced revolving weights which are mounted on a belt driven shaft running

*Presented Before the Convention of the National Crushed Stone Association, January 17, 1928.



A Three Deck Niagara Vibrating Screen



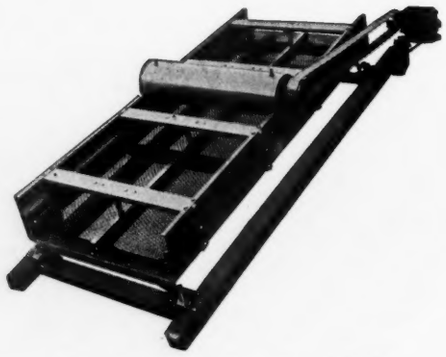
The Traylor Vibrating Screen

in dust tight ball bearings at 1,800 r. p. m. It is furnished single or double deck and is recommended for material up to ¾ inch but can handle up to 2½ inch. The cloth frame is supported on four flat spiral springs and the cloth is intended to whip.

The Universal screen has an elliptical shaped vibratory motion with the greatest axis of the ellipse perpendicular to the screen cloth. This motion is imparted to the entire screen cloth frame by means of unbalanced revolving weights which are mounted on a belt driven shaft running in dust tight ball bearings at 1,800 r. p. m. It is furnished in single deck only and recommended for material up to 2 inches but can handle 2½ inch. The cloth frame is supported at each end on a full elliptic steel spring, mounted crosswise of the screen frame thus permitting full motion perpendicular to the cloth but restricting the motion lengthwise of the cloth. Three-quarter h. p. is required. It is claimed that the cloth can be changed in five minutes. Because of the small travel of the vibratory motion a change of rotation of the rotating weights has no noticeable effect.

To the class of Positive Throw Eccentric operated screens belongs the Pittsburgh Coal Washer Company's Pittsburgh vibratory screen; Sturtevant Mill Company's Moto-Vivro screen; Niagara Concrete Mixer Company's Niagara screen; Robins Conveying Belt Company's Gyrex screen; and Simplicity Engineering Company's Simplicity Super screen. The Pittsburgh Vibrator screen has a reciprocating vibratory motion in a direction perpendicular to the screen cloth.

The motion is imparted to the entire screen cloth frame by means of connecting rods and eccentrics. The eccentrics are mounted on belt driven shaft which runs in dust tight self aligning ball bearings. The cloth frame is supported on spiral steel springs. Recommended to handle up to 2 inch feed on 1½ inch mesh cloth. Furnished in single or double deck. Also furnished in single or tandem screen frames either single or double deck. The h. p. required for single screen double deck is 1½ h. p.



The Universal Vibrating Screen

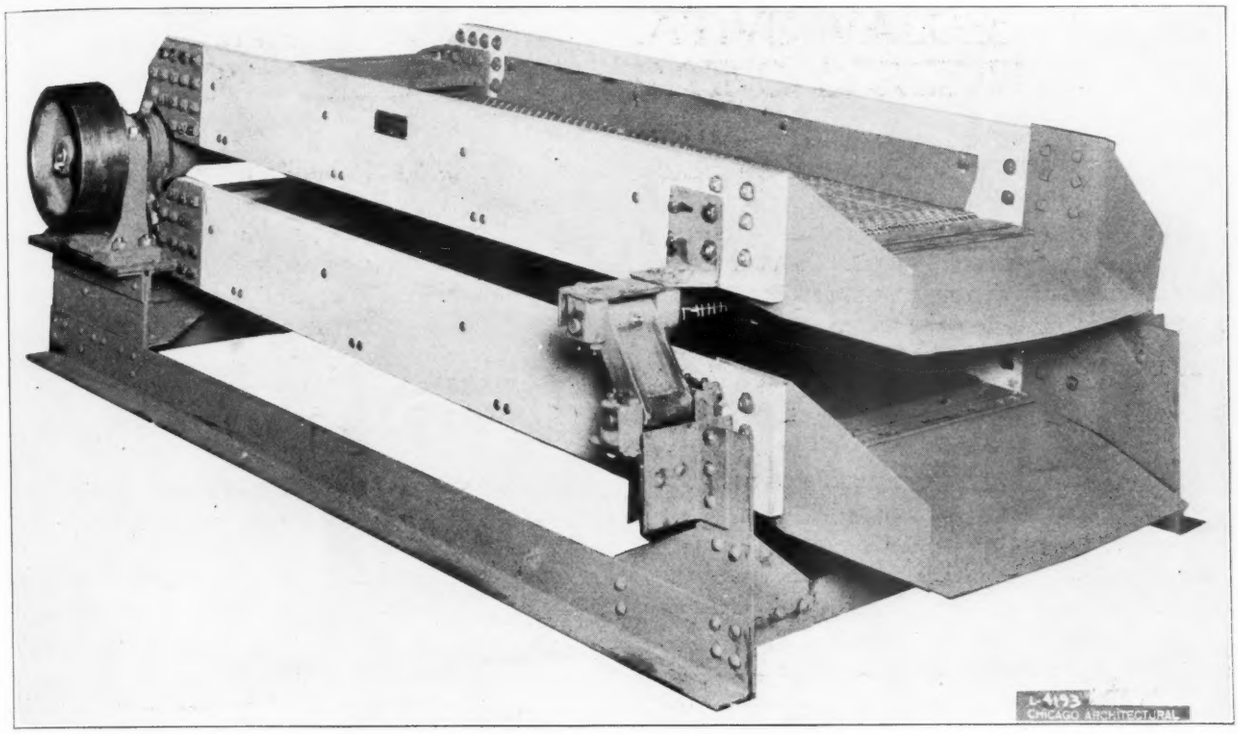
The Motor-Vibro standard and heavy duty screens have a reciprocating vibratory motion in a direction perpendicular to the screen cloth. The magnitude of vibration on the standard screen is practically equal throughout the length of screen cloth, while on the heavy duty screen it is much stronger at the top of the cloth than at the bottom. The vibratory motion in each case is imparted to the entire screen cloth frame by means of an eccentric operated push rod opposed by a coil spring. The eccentric operating mechanism is encased in oil and is belt driven at 1,800 r. p. m. more or less. Maximum size material recommended for standard screen is ½ inch and for heavy duty screen is 2 inches. It is furnished in one, two or three deck types, 2 h. p. is required.

The Niagara screen has a rotary vibratory motion imparted to the entire screen cloth frame by means of eccentrics mounted on a belt driven shaft running in dust tight roller bearings at 500 to 3,000 r. p. m. Various throw eccentrics can be furnished to suit various screening conditions. Furnished in one, two or three deck types.

The Simplicity Super screen has a rotary vibratory motion imparted to the entire screen cloth frame by means of eccentrics mounted on two shafts geared in common and running in dust tight ball bearings. The eccentrics are counter-balanced to eliminate vibration in the main frame. Recommended for material up to 5 inches, furnished in one, two or three deck types. Seven and one-half h. p. motor is recommended. The screen drive may be either belt or direct connected motor.

To the class of Electro Magnet operated screens belongs the W. S. Tyler Company's Hummer screen; and the Traylor Vibrator Company's Screen Supreme.

The Hummer screen has a reciprocating vibratory motion imparted to the screen cloth only, by means of electro magnet action in the up travel and spring action in the down travel, the up travel being brought to a sudden termination by means of adjustable striking plates. The vibration is perpendicular to the cloth and is greater at center of the cloth than at ends. There are no bearings or other



The Roberts and Schaefer Vibrating Screen*

wearing parts in the screen except the cloth and the striking plates. There is required, however, a 15-cycle alternating current generator which supplies a current of 30 impulses per second or 1,800 impulses per minute resulting in 1,800 screen vibrations per minute. The generator may be belt or direct motor driven. One-half to one h. p. is required per screen, but the smallest generator outfit furnished is with 2 h. p. motor. The screen is furnished in one, two or three deck types.

*Under the positive throw eccentric class of screens is the unit made by the Roberts and Schaefer Company, which operates on a 2° or 3° slope, with a combined rotary and reciprocating action at 500 r.p.m. These screens are made in single and double deck units with screen cloth size 3 to 1/16 inch hole. A minimum of moving parts is used—all bearings are of dust-proof, anti-friction type, and a 3 h.p. motor is ample to drive a double deck unit. The R and S Screen requires only 2 feet of head room, and accurate sizing, maximum capacity, and close contact of material with screen surface is assured by reason of only 2 or 3° slope, and the complete rotary reciprocating vibration of the entire screen surface. Constant agitation of material and complete vibration are secured through the medium of two eccentrics mounted on the main drive shaft.—Editor.

The Traylor Screen Supreme has a reciprocating vibrator motion imparted to the entire screen cloth frame by means of electric magnet action in the upward direction opposed by the spring action of flexing bars. In comparison to the Hummer screen just described, which uses a 15 cycle alternating current to obtain 1,800 impulses per minute. The Traylor screen uses a mixture of direct current and 60 cycle alternating current to obtain 3,600 impulses per minute. The vibration is perpendicular to the cloth and of equal magnitude throughout the cloth length.

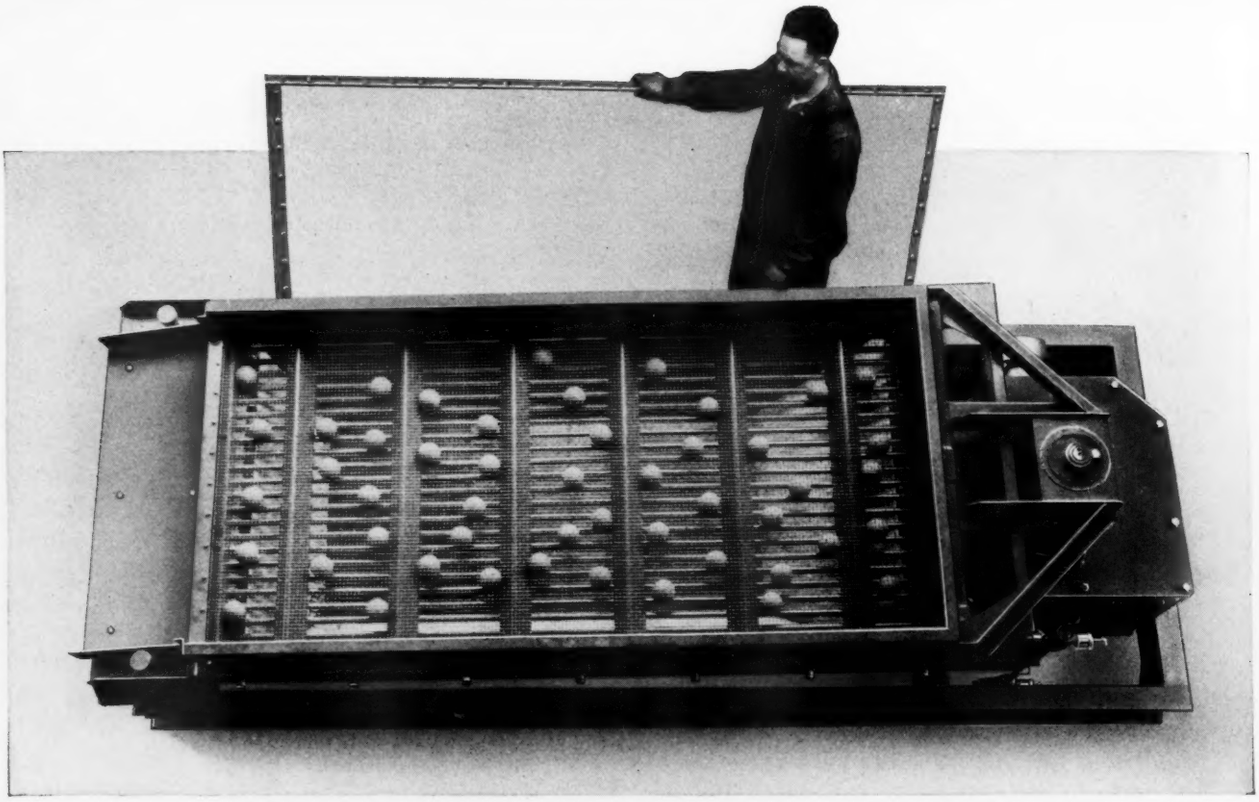
It will be noted that this is the greatest number of impulses per minute of any of the screens discussed. The manufacturers of this screen justify this high vibrating speed by the theory that by keeping the coarser particles suspended in the air as much as possible the fines will have more opportunity to get through the mesh.

The flexing rods are adjusted or tuned to a period of vibration that corresponds to the magnet impulses. There are no bearings or other wearing parts on the screen except the cloth. There is required, however, a generator set to supply the direct current and also the alternating current if it is not otherwise available. A ½ h. p. motor is required for making direct current only, and a 3 h. p. motor is required for making both direct current and alternating current.

The screen is furnished in one or two deck types and recommended for 2½ inch material, but is handling material on 3 inch square opening cloth. A screen equipped with bars instead of cloth is recommended for handling larger sizes. The screen is usually suspended from above on suspension rods, thus requiring no foundation.

To the Cam or Bumper class belongs the Deister Concentrator Company's Leahy No-Blind vibrating screen; Norwood Engineering Company's James Screen; and the Orville Simpson Company's Rotex screen.

The Leahy No-Blind screen has a reciprocating



Looking Down On An Orville Simpson Screen Showing An Extra Screen Cloth in the Operator's Hand.

vibration imparted to the screen cloth only, by means of an 8-tooth oil immersed cam running at 200 r. p. m. and causing 1,600 vibrations per minute. Relatively the cam forces the cloth downward slowly, and upon release the cloth under spring pressure moves upward quickly, and stops abruptly when the cam tappet strikes the bottom of the cam tooth, thus giving the cloth a hammer blow effect. The amount of spring pressure and therefore the intensity of vibration is adjustable. The vibration is perpendicular to the screen cloth and is greater in the center of the cloth than it is at the ends. The cam may be belt driven or motor driven through an enclosed oil immersed gear reduction.

The screen is furnished in one or two deck types and is recommended for material up to 2½ inches. The horsepower required is ½ h. p. but a 1 h. p. motor is recommended.

The James screen has a horizontally reciprocating vibratory motion imparted to the entire screen cloth frame by means of a totally enclosed oil immersed motor driven bumper. This mechanism delivers 1,800 horizontal hammer blows per minute to the upper side of the inclined screen cloth frame. This frame is supported on four flexible hangers which have sufficient spring action to cause the cloth frame to return to position after each blow. The screen can be had in single or double deck types. It is claimed that the cloth can be changed in one minute.

The Rotex screen is a combination shaker and vibrator screen. The shaking motion varies from a 3½ inch diameter circle at the feed end, to an egg shape at the center, and to an almost straight line reciprocating motion at the discharge end. It is claimed that due to this motion particles will travel on an eight foot screen an estimated distance of 30 feet before reaching the discharge end.

This shaking motion is imparted to the entire screen cloth frame at the rate of 210 gyrations per minute by means of a belt driven totally enclosed oil immersed ball bearing eccentric and mitre friction transmission.

The vibratory motion is perpendicular to the cloth and is imparted directly to the cloth at numerous points by numerous rubber balls which are retained in cage compartments just beneath the screen cloth. As the screen frame shakes the balls roll first to one end of their compartment and then to the other end, striking beveled partition bars from which they bounce upwards, striking the under side of the screen cloth.

Three inch diameter balls are used for 1 inch material and 4½ inch balls for 1½ inch material.

The screens can be had in single and double deck types. They require from 3 to 5 h. p. The slope of the screen is very slight, usually four degrees. It is claimed that this screen is particularly valuable for washing because of the long travel the material makes over the cloth and because of the sliding scrubbing action.

This includes the enumeration of the features of the various makes of screens.

(*Continued on page 74*)

# GYPSUM IN BUILDING CONSTRUCTION

By Henry J. Schweim

Chief Engineer, Gypsum Industries*

CONSIDERING the present use of gypsum in building construction it seems rather strange that its first use in this country was not as a building material but as land plaster or agricultural gypsum. That was about one hundred and twenty-five years ago or at the beginning of the nineteenth century. The old saying, "the first hundred years are the hardest," surely applied to the gypsum industry because it was not until the twentieth century that real progress was made. Some idea of the growth of the industry since 1900 can be obtained from the government reports giving the tonnage produced per year. In 1900 there were mined in the United States 594,462 tons of gypsum; in 1910 this had increased to 2,379,057 tons; in 1920, 3,129,142 tons were produced and in 1926 the production had increased to 5,635,441 tons.

All of the material of course did not go into gypsum plaster. Plaster is only one of many gypsum building products. Today it is possible and practical to build an all gypsum house—gypsum walls, floors, partitions and roof. If wood studs and joists are used these can be protected against fire by the use of gypsum sheathing board, gypsum wall or plaster board and gypsum plaster, and the space between the studs filled with a special gypsum insulating material.

Why are all these different gypsum products on the market and why has their consumption increased by leaps and bounds? I believe the answer can be found in the fact that inherent in gypsum are properties which are not to be found in any other one material. They are fire resistance, insulation, light weight, strength and adaptability.

## Fire Resistance

To understand the fire resistance of gypsum it is necessary to have some knowledge of the chemical properties of the material and also the refining process. Gypsum contains one part of calcium sulphate and two parts of water; therefore its chemical formula is $CaSO_4 \cdot 2H_2O$. In the calcining process which converts the material from ground raw gypsum to calcined gypsum or plaster of Paris, one and one-half parts of water are driven off, leaving $CaSO_4 \cdot \frac{1}{2}H_2O$, or calcined gypsum, which is the basis of all gypsum products. When water is added to calcined gypsum it takes up or combines with the same amount that was driven off during calcination; in other words it reverts to $CaSO_4 \cdot 2H_2O$.

It is the water of crystallization in the gypsum that gives it its unique fire-resistive properties. When subjected to fire gypsum begins to calcine; that is, the chemically combined water is liberated and as it is a law of physics that water cannot be heated above 212° F., so gypsum cannot be heated above 212° until all of the water is driven off.

This was very well illustrated in the calcination tests conducted on gypsum partition tile at the Underwriters' Laboratories, Inc., in 1911. In these tests samples of 6-inch solid gypsum block were subjected to temperatures of 1000, 1300, 1600, 1900 and 2200 degrees F. for periods of ½, 1, 1½, 2, 3, and 4 hours. Thermocouples were placed in the specimens undergoing test at distances of 1, 2, 3, 4, and 5 inches from the surface and thermometers placed on the unexposed side. The object of these tests was to show how efficiently gypsum insulate against the transmission of heat at high temperatures. Under the most severe conditions when the tile were subjected to a furnace temperature of 2200° F., the temperature on the unexposed side was 86° at the end of one hour, 144° at the end of two hours, 186° at the end of three hours and 208° F. at the end of four hours.

In a test on a 5-inch solid gypsum block partition plastered with gypsum plaster in which the temperature on the exposed side was 2300° F., at the end of four hours the temperature on the unexposed side was 153° F. Some idea of what a temperature of 2300° F. means can be gained from the fact that the fire brick sides of the test frame and the concrete lintel above fused and ran down on the gypsum panel; even the plaster exposed to the fire was vitrified in spots, yet the temperature on the unexposed side was but 153° F.

I know of no other structural fire resisting building material which will insulate against the transmission of heat at high temperatures as will gypsum.

Take gypsum plaster, for instance. In fire tests conducted by Mr. W. A. Hull at the Bureau of Standards on concrete columns unprotected and protected with one inch of gypsum plaster, he found that after a four hour fire test the ultimate strength of the gypsum insulated column was slightly more than three times that of the column which did not have the gypsum plaster protection.

In fire tests recently conducted at the Bureau of Standards on clay tile walls, it was found that an 8 inch load bearing clay tile wall, unplastered, failed by conduction in one hour and 45 minutes. When this wall was plastered with gypsum plaster, due to the insulation provided by the gypsum, its resistance period was just doubled and failure did not occur until it had been exposed to the fire for

*(Address delivered before the Building Material Dealers Association of Eastern Pennsylvania at their Annual Convention in Philadelphia on January 19, 1928)

three hours and 30 minutes. These tests also developed the fact that a gypsum or portland cement plaster will stay in place during practically any fire exposure.

However, more than fire resistance is required of wall plaster if it is to meet with general approval. It must possess properties such as strength, ease of preparation and application, quick setting and drying, so as not to delay the work while waiting for the plaster to dry, and it must properly bond to the bases commonly employed in building construction.

## Strength

The strength of a plaster is a very important factor. It is this quality which enables it to withstand the abuse to which it is liable to be subjected without cracking. The American Society for Testing Materials' Standard Specifications for Gypsum Plasters require that neat plaster shall have a tensile strength of 150 pounds, wood fibered 125 pounds, gaging 200 pounds, sanded 2:1, 75 pounds, and sanded 3:1, 50 pounds. I know of no gypsum plaster, the tensile strength of which will not exceed these requirements.

## Acoustics

A great deal of stress has been put on the acoustics of wall plaster by some manufacturers in an endeavor to show that one type of plaster possesses sound absorbing qualities not possessed by another. I have yet to see any authoritative tests to substantiate these claims. I am not referring to those specially prepared acoustical plasters, some of which do have merit, but to ordinary wall plasters commonly used in building construction.

The coefficient of absorption of sound of all ordinary plasters is so nearly the same that from a practical standpoint there is no difference. I make that statement without fear of successful contradiction and base it on such eminent authorities as Dr. F. R. Watson of the University of Illinois, Dr. Paul E. Sabine of the Riverbank Laboratories, Dr. Paul R. Heyl and Mr. V. L. Chrisler of the Bureau of Standards.

Dr. Watson of Illinois has written a book entitled "Acoustics of Buildings" in which he discusses in detail the tests conducted to insure good acoustics in certain buildings. A number of these buildings I knew were plastered with gypsum, but I did not know about several others, so I wrote the doctor for this information and in reply he stated:

"In the experiments referred to, the plasters were considered incidental to the main problem—that is, all ordinary plasters have about equal merit from the acoustic standpoint."

Several years ago The Gypsum Industries and the National Lime Association cooperated with the Bureau of Standards and had tests conducted to ascertain the acoustical value of gypsum and lime plaster. The tests showed that gypsum plaster absorbed more sound than lime with either a trowel finish or a sand float finish, but that lime absorbed more sound than gypsum when the finish was left off. However, in actual construction it must be remembered that a finish of some sort is required and supplied. The Bureau's report in commenting on the tests called attention to the fact that the coefficients of absorption of all the plaster panels tested, while differing among themselves, were so small as to be of no practical importance. I am stressing this matter so that when you hear of anyone referring to the acoustical value of his plaster, unless it is a specially prepared and compounded acoustical plaster, you may know it is nothing more or less than a sales argument without the basis of fact behind it.

## Sand

While on the subject of plaster there is one important thing I want to call to your attention and that is sand. Sand is added to gypsum plaster for two reasons. One is to increase the porosity of the base coat for the reception of the finish coat and the other is to increase the covering capacity of a given amount of material. Since the strength of plaster is decreased in proportion to the amount of sand used, it is necessary to guard against oversanding. Another point which is just as important is the kind of sand used. Fine sands should never be used with gypsum plaster because they have an enormous surface area in proportion to their volume and consequently a large proportion of cementitious material must be used to properly coat fine sands than coarse sands. The American Society for Testing Materials' Standard Specifications for Gypsum Plastering Sand require that not more than six per cent shall be retained on a No. 8 sieve, not less than eighty per cent shall be retained on a No. 50 sieve and not more than six per cent shall pass a No. 100 sieve.

## General Remedies

This is the time of year when you are apt to have sweat-out complaints. A sweat-out means that the gypsum has combined with the required amount of water to form the crystal but the excess water used in mixing has not evaporated. As warm air will carry more moisture than cold air, the remedy for this condition is to introduce heat, which will raise the water carrying capacity of the air; then open a few windows to provide a free circulation of air and the excess water in the plaster will be carried away. A sweat-out must be corrected immediately however because if this condition is allowed to continue the walls will never attain their full strength. A sweat-out can easily be detected because although the plaster has set it will be soft and damp and the wall will be dark in color.

A dry-out is just the opposite of a sweat-out. A

dry-out is caused by the water evaporating before the plaster has had time to set. This is usually caused by hot blasts of air striking the plaster and therefore dry-outs are usually found around openings. A dry-out is soft and crumbly and has a light chalky appearance.

To prevent dry-outs, screen all openings in summer so as to prevent hot wind from striking the plaster. Do not close the openings with building paper as a free circulation of air is necessary to carry off the moisture. As a thin coat of plaster is more liable to dry out than a thicker one, see that the proper thickness of plaster is applied.

A dry-out can be corrected. All that the plaster needs is water; therefore, spray the walls with clean water. If one treatment does not correct it, spray the walls again. This may have to be done several times but the plaster will set if given enough water.

Wood lath should be wet down the day before plastering and again an hour or so before the plaster is applied. If the lath are dry when plaster is applied they will absorb the water required to set the plaster and a dry-out is very likely to occur. Wood lath swell when they get wet, and if they have not been wet down before plastering to give them a chance to expand they will expand and perhaps buckle when the plaster is applied. The result will be either cracked walls due to the buckle or loose plaster due to the keyes being sheared off.

Water has a more important effect upon the set of plaster than most plasterers realize. Nothing but clean water should be used. Stagnant water may contain organic substances which would cause a slow set, and if water is used in which the plasterers' tools have been washed a quick set is very apt to result. This is due to the fact that small particles of set plaster act as a nucleus and cause the plaster to crystalilze around it a great deal faster than it otherwise would. That is why slow set can often be remedied by simply scraping off the set plaster from the sides of the mixing box or by screening a little set plaster into the mix.

Calcined gypsum has a great affinity for water. Consequently if plaster is stored on the ground or in a damp place it will draw the moisture from the soil or the atmosphere as the case may be and short working plaster will result; that is, the plaster will not carry the usual amount of sand and it will be difficult to apply. However, short working plaster can be used satisfactorily by mixing it with fresh plaster.

## Gypsum Lath

With reference to plaster board or gypsum lath as it is now called, I believe you are all aware of the tremendous increase in the use of this commodity in the last couple of years. This is one of the most interesting stories in the gypsum industry.

The patent on Sackett Board, with which you are familiar, was issued to Augustine Sackett on May 22, 1894, and we must give this inventor credit for having real vision as his patent was on an "Inside Wall Covering" to be used as a substitute for lath and plaster. As manufactured, Sackett Board was used as a substitute for lath only and it was approximately twenty years later before a gypsum wall board was developed that could be used for both lath and plaster.

The old Sackett Board was composed of four layers of special wool felt paper with three intermediate layers of gypsum plaster. After the expiration of the Sackett patent numerous patents were issued as "improvements" on plaster board. Some of these were on special reinforced edges, some on a specially formed surface providing a mechanical key for the bonding of the plaster coat, some were on two paper board which has become the generally accepter standard and some on a board without the paper facing. The face dimension of the old Sackett Board was 32x36 inches, which size remained as standard from 1894 until within the last few years and in some markets it still is the standard size. For some unknown reason it never dawned on the manufacturers of plaster board to investigate the possibilities of a smaller sized board; 32x36 inches seemed a part and parcel of the mill. A fair tonnage was disposed of each year, but it was nothing phenomenal until the manufacturers decided to try out smaller units, 16x32 inches and 16x48 inches, and then bundle them so as to facilitate handling, both in stock and on the job. From that moment on the sales curve on gypsum lath turned upward and it has been pointing in that direction ever since. Sixteen, thirty-two and forty-eight are all multiples of sixteen, the standard spacing of studs and joists, and consequently boards with these dimensions lend themselves readily to job conditions with a minimum of cutting and fitting. These boards can, when required, as in the end bays or spaces, be placed with the long dimension vertical.

The main advantages of gypsum lath which are responsible for its tremendous success are:

(1) Rapid Installation
(2) Economy
(3) Perfect Bonding of Plaster
(4) Saving of Plaster
(5) Fire Resistance

With regard to the adhesion of gypsum plaster to gypsum lath I have been asked numerous times, "What makes the plaster stick?" If you were to examine a section of gypsum lath to which gypsum plaster was applied, you would find that the gypsum in solution had penetrated the pores of the paper and crystallized, and that the fiber of the paper, like millions of fingers, had extended into the set plaster forming a perfect bond. So perfect is this bond that in tests conducted at the Bureau of Standards to determine the adhesion of gypsum

plaster to various backings it was impossible to develop the bond when gypsum lath were used and attached to supports sixteen inches on centers which is standard practice, as the bond was such that when an attempt was made to pull the plaster from the board, either the board would break or the paper covering would split, part of it sticking to the board and part sticking to the plaster. Therefore in order to determine the adhesion of gypsum lath, specimens were nailed to a solid wooden base. So applied, it required a pull of six pounds per square inch to separate the plaster from the board. This is a factor of safety of 144. Tests were also conducted to determine if, when the board became accidentally wet due to leaky plumbing, the decrease in bond between the plaster and the board was sufficient to require special means for taking care of it. Consequently the plaster was applied in the usual manner, dried and then wet before testing. The adhesion in pounds per square inch was 2.99 which provides a factor of safety of 72. Other samples were dried, then wet, then dried for 7, 10, and 21 days before testing and it was found that the adhesion increases again to its original value upon drying.

### Gypsum Wall Board

Gypsum wall board is the board Mr. Sackett thought he invented and is used as a substitute for both lath and plaster. On account of its fire resistive properties it is approved wherever wood lath and plaster are permitted.

The main difference between gypsum and wall board and gypsum lath is in the kind of paper used on the surface and the size of the board. As wall board is designed to be used as a finished wall surface it naturally must be uniform in color and have a smoother, harder surface suitable for receiving decoration, while the paper used on gypsum lath must be more or less open or porous to receive plaster. The fire resistance of gypsum wall board was very well demonstrated in fire tests conducted at the Underwriters' Laboratories, Inc. In the Specifications for Private Residences, prepared by the Committee on Building Construction of the National Fire Protection Association it is required in certain types of residences that if wood studs are used they shall be covered either with incombustible lath or incombustible wall board.

## Testing Hydraulic Cements

The compressive strength of mortars and concretes is proportional to a function of the absolute volumes of the constituents. It is suggested that a proportionality constant be evaluated which could be used for any hydraulic cement and that a graded sand be used, that the mix be stiff but plastic and that some water should be retained. R. Feret (Rev. Mat. Conc. Trav. public. No. 217, 1927, and C. A.).

## Government Awards Contract for Drilling 6th and 7th Potash Test Wells

Preliminary churn-drill operations have been completed at potash well No. 6, in Upton County, western Texas, and core drilling will begin immediately, announces the United States Bureau of Mines, Department of Commerce, which has engineering supervision of drilling operations in the Federal Government's program for the development of commercial potash deposits in this country. Potash well No. 6, work on which began January 7, is located on the Burleson-Sun Lease, Section 100, three miles north of McCamey, on a site designated by the United States Geological Survey as being favorable for exploration purposes. The top of the potash-bearing salts lies approximately 500 feet beneath the surface. The probable depth of the hole will be about 1,500. A contract for this well and well No. 7 was awarded to the lowest bidder, the Pennsylvania Drilling Company of Pittsburgh.

After the completion of potash well No. 6, the drill will be removed to the site selected for well No. 7, on the Hughes-Roxana Lease, Section 4, William Teer Survey, Upton County, about 10 miles north of McCamey, and approximately seven miles distant from the site of well No. 6. The top of the salt formation at the site of well No. 7 lies about 450 feet below the surface. The depth of this hole will range from 1,200 to 1,500 feet. Samples taken from churn-drill sludges from oil wells drilled in the vicinity of wells 6 and 7 have shown the presence of potash salts. Both wells should be completed in the early spring. It is expected that at least one more test well can be drilled under the appropriation for the current year.

Potash test well No. 5, located in the northwest quarter of Section 16, of the G. C. & S. F. Survey, on Harris Brothers' ranch, Crockett County, Texas, was completed December 2, at a depth of 1,799 feet, 2 inches. At this well, the churn drill was used to a depth of 1,161 feet, 4 inches, and the diamond drill used for the remaining 637 feet, 10 inches. A perfect core recovery of 637 feet, 10 inches, was obtained through the salt formation.

## Building Cement or Plaster

Clay, preferably containing at least 12% aluminium, is treated with caustic soda solution, roasted at a temperature below that which will drive off all water of crystallization mixed with an alkaline earth containing a large percentage of calcium compounds, such as dolomitic limestone, digested as slurry with sulphuric acid, and treated with more alkaline earth. The whole mixture is roasted at 100-315 degrees, depending upon the setting properties desired in the final product. C. E. Kraus (British Patent 253,929, in B. C. A.).

# ROADS AND THEIR USE

By A. J. Brosseau

President, Mack Truck, Inc.*

IN 1909 a young man engaged in manufacturing automobiles asked a Detroit banker for a loan. He was turned down. The banker said the saturation point had been reached and the public had all the automobiles it needed. The registration that year was 306,000 passenger cars and 6,000 trucks. It is interesting to note that on the first of this year the registration figure was 20,140,000 passenger cars and 2,985,000 trucks, a total of 23,125,000.

I am not familiar with your industry, but I assume as a matter of course that you, too, have your "Doubting Thomases" who for many years have said that the use of crushed stone for road purposes has reached the peak.

## Great Road Expansion Ahead

The future of highway transport was never brighter than it is now. There are in use today nearly 3,000,000 miles of highway of which some 600,000 miles are surfaced.

The ever increasing number of vehicles and their greater utilization create a demand for better roads —wider roads—more and more roads. At the present rate of 40,000 or 50,000 miles of new hard-surfaced road construction a year your industry and all related lines will be called upon to furnish vast amounts of materials with which to carry on the program.

## Transport Agencies Have Distinct Fields

While you and I may see only the physical task of turning out so many vehicles, so many tons of material or a certain quantity of road machinery, we are actually engaged in the building of a new transportation system.

The rail lines—whether steam or electric—are, and always will be, the backbone of our transportation system, and will carry the bulk of the heavy and long distance tonnage, but there is a universal demand for more flexible facilities for the "small lot" movement of persons and commodities. Distribution, the problem constantly before the farmer and industrialist alike, is dependent upon adequate facilities to move goods cheaply and quickly from one point to another. More than ever, time is an essential factor and it is that, and the ability of the motor vehicle to operate where, when and as needed, that has won it recognition in the transportation field.

An analysis of the evidence presented by farmers and shippers, during hearings conducted in 1926 by the Interstate Commerce Commission in every section of the United States, for the purpose of bringing out the facts with respect to the operation of the motor vehicle in its relation to other carriers, will convince any one that this unit is fast finding its place in the transportation field.

In the light of this evidence the truck can no longer be looked upon as a competitor of the railroads. Instead it must be viewed as an added arm of the transportation service. The increasing tonnage handled by rail lines is further proof that they are not suffering from the competition of highway transport.

## Highway Conditions Limit Truck Use

The highway over which they travel is the only limitation to the use of the truck and the bus. As a result of the cooperation between state highway authorities and the United States Bureau of Public Roads, we are well on our way toward the initial improvement of 200,000 miles of main highway in the Federal seven percent system, which will be the backbone of our new transportation system.

Steady progress has also been made in the improvement of the roads in the secondary and tertiary systems until it is possible, in nearly all parts of the United States, for a great majority of motor vehicles to travel on an improved highway.

## Road Building Will Never Be "Finished"

At the present rate, the primary system will be improved "once over" by 1930, but, as the able Chief of the United States Bureau of Public Roads, Mr. Thomas H. MacDonald, has pointed out, the work on this or on other systems will never be finished in the sense that we can say we are through—within a period of time we can now foresee. As motor transportation develops we will be faced by demands for wider, straighter and stronger roads; longer roads—more roads.

## Must Use Present Roads More

Insofar as funds permit the roadbuilders are now meeting that demand. In addition to building new and wider roads, highway authorities will, in the future, largely increase the carrying capacity of our present roads by eliminating grade crossings and all obstructions or obstacles that interrupt the constant flow of traffic.

I will give an example. Here is a fine highway wide enough to carry four lanes of traffic. All goes well until it crosses another road at grade. Immediately the carrying capacity of both roads is cut in two. Another road of great carrying capacity

*Presented Before the Annual Banquet of the National Crushed Stone Association, January 18, 1928.

may lose two-thirds of its usefulness because of congestion at a bottle neck.

### Much Road Capacity Wasted

In these instances, found chiefly in the heavily traveled centers of the East, the public suffers because of high operating costs.

The shipper whose equipment and personnel are tied up by these delays as well as the other user whose time means money, are sustaining definite out-of-pocket losses through their inability to fully utilize the carrying capacity of the existing roads.

The investment necessary to correct these conditions, while large, will be more than offset by the increased returns derived from the utilization of the road's full carrying capacity.

In this field, as in the construction of by-passes around centers of population, more attention should be given to the problem of deriving a maximum degree of service from the roads which we already have. Increase in mileage, width, and depth, necessary as they may be, will not do the entire job. In congested terminal areas we must provide facilities that will make it possible to keep the traffic moving without interruptions.

At Cleveland, Ohio, and in New England, New Jersey and Pennsylvania, a series of experiments has been carried on by the U. S. Bureau of Public Roads and local road authorities by means of a new device for the recording of congestion causes. The machine is known as a "space-time" recorder and operated in connection with a passenger car following the normal flow of traffic checks the causes of congestion, indicates average rate of speed and points the way to needed changes. In this economic engineering approach to the problem appears the greatest hope of the future for the effective use of our tremendous system of motor transport.

### Engineer Can Increase Road Use

Our engineers can readily determine the carrying capacity of a road surface in numbers of units and weight, but the public must authorize the engineer to design it in the most efficient way.

Unless this is done, the maximum return from highway investment cannot be secured, nor will the public enjoy low operating costs.

Here, if I may, I should like to call your attention to a public responsibility which rests upon you who are in the road building field and upon those of us who manufacture the vehicles which travel over your highways.

The enormous expenditures of public funds, which are incident to the completion of this great task, make it incumbent upon every man who is connected with the project to do his part to see that the using public obtains a full return for the taxes which it appropriates. Let me cite a few of the ways in which we can serve.

### Mass Production and Research Would Aid

In our factories we are constantly seeking to improve details of design and production methods, so as to provide the public with improved vehicles at the same cost, or even lower. Is there not much which can still be done in the mass production of roads?

### Road Control Should Be Studied

Our state and Federal authorities are working together in the construction of a definite system, but frequently they have no part in the development of the secondary systems. Similarly there is a borderland just within the limits of municipalities where adequate connections with State highways have not been built and cannot be built under the usual methods of financing. This points to the necessity for greatly reducing the number of jurisdictions imposed upon major traffic flow lines.

Further coordination is necessary if the public is to be assured that its funds are being expended in the improvement of those roads which are of the greatest importance, and also that the character of the improvement is economically sound.

### Highway Safety Vital

Your industry and mine has a common interest in reducing highway accidents. Research into the causes of accidents will suggest means of preventing them.

Taxation is another question which is important. There is need for further study and investigation into sources of income in order that the highway burden be fairly placed upon property and upon the users of motor vehicles.

### Highways Greatest Public Works

Last year the public appropriated funds amounting to more than $1,000,000,000 for road improvement. This year and subsequent years a like sum will be required annually. In special taxes alone the motor user paid this past year to taxing authorities, more than $600,000,000.

The application of even the smallest time saving device or method, either in administration, construction, maintenance, or employment, will result in the saving of a large sum of money.

Here again the continuing cooperative research of the U. S. Bureau of Public Roads, state and local highway authorities, has been and is today of inestimable value.

We are partners in an undertaking which is without parallel in the history of public enterprise. The influence which these roads of ours have already exerted upon life in the United States can be appreciated only as we glance backward and remember conditions as they existed in "the good old days." Let us give the men who are charged with the task of carrying on, the full measure of our support in their great effort.

# DEVELOPMENT OF TENNESSEE'S HIGHWAY SYSTEM

By C. N. Bass

State Highway Commissioner of Tennessee

THE development of a state highway system presents a multiplicity of interesting problems, which, for the most part, are foreign to our usual trend of thought, but which, at the same time, are intensely vital to our welfare. International and intra-national relationships are necessary to the development of the people of the world. The more easily and quickly this communication and communion can be carried on, the better the understanding between the sections affected. As a striking example of the effect of the reduction of the time element in transportation and the contagious affection it promotes, one can cite the international good will created by the incomparable Lindbergh through his trans-Atlantic flight to France and also his non-stop flight to Mexico.

It does not require a student of political economy to observe the results of improved highway conditions. Tennessee, now interwoven with a network of state highways, over which travel is comparatively rapid, safe, and comfortable, has virtually erased sectional lines, and, as never before in her history, is marching forward so rapidly that now she is readily accorded a place among the most progressive states of our Nation.

By way of history, I might explain that little had been done toward highway development in Tennessee until after the World War. A State Highway Commission was organized by the acts of the 1915 Legislature. This commission was a large non-paid commission and their work was chiefly promotional. In 1917 this commission was replaced by a three-man paid commission which was provided with only meager funds for highway construction. This commission was replaced in 1923 by the present system of having one commissioner. The results accomplished during this period of evolution made little showing. Our people were impatient. The State Highway Department did not have the public esteem and confidence. Nevertheless, promotional work had to be done. Impetus had to be given the highway movement. In speeches before County Courts and gatherings, the speakers actually had to argue the necessity of roads; that roads were an economical investment. All this took time, and when the people became convinced of the necessity for good roads they became impatient because they did not have them all at once. However, Tennessee, profiting by the experience of other states, started slowly, but constantly gained momentum.

Prior to 1923 the funds for State Highway work were obtained from the following sources; a state property tax; a motor vehicle license tax; Federal aid; and County cooperation. Funds for county cooperation were also derived from a tax on property. In 1923 the Legislature made the first radical change in the system of financing. It repealed the state property tax and passed a two cent per gallon tax on all gasoline sold within the state. This was a move to place the burden of road building upon the road user. This new tax, together with the others in effect, provided the Department with approximately six million dollars annually, with a substantial annual increase from increased usage in sight. This six million looked big in those days.

In the latter part of 1924 the Department adopted a policy that almost overnight changed the attitude of our people from one of impatience and disapproval and support. I refer to the policy of maintenance by the patrol method of the entire designated state highway system, so that with the minimum expenditure the maximum of use and comfort could be derived from the existing roads. My conception of our duty underwent a change. Formerly our duty was thought to be that of actual road construction, or more narrowly the awarding of contracts and the completing of projects. If we decided to build a section of roadway the contractor was given charge and the road was blocked. If by chance anyone chose to travel over that particular route, it was left to him to find his way around, if he could. Now we interpret our duty as that of rendering traffic service, be it merely the erection of proper signs for guidance, or the production of a finished high class roadway.

The building of roads is an incident in this scheme. So is maintenance. If we can keep our travelling public moving comfortably, safely, and speedily, with roadway improvements keeping pace with the growing traffic demands, then we will be discharging, in the broadest sense, our duty. Therefore, convenience to the travelling public received first consideration at our hands.

It fell to the 1927 Legislature to practically complete the reorganization of our system of financing. Our taxation system for highways is now based on the "benefit principle" rather than on the "ability to pay principle." All revenues for road building and maintenance are now derived from the motor vehicle. The county bonds used by the State are also being repaid from this source. It remains for another legislature to require those who receive a special benefit from the use of the roads, or who do a special damage to the roads, to pay in proportion to that special benefit, or enough to repay that special damage. I refer to the group of motor vehicles operated on the highways as public utili-

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ties, carrying passengers and freight. These render a definite public service and their operation should be encouraged, but not with unfair advantages over other competing utilities, or at the expense of the private user of the highways.

The present sources of income, supplemented when necessary by borrowing in anticipation of our income, enables the Department to carry on an anunual highway program of fifteen million dollars. Maintenance is primary and is provided for first. The construction funds are then allocated to the four divisions of the State (representing functional divisions of the State Highway Department) in the proportion of that division to the remainder of the state in area, population and road mileage. The program is that of caring for the greatest traffic needs first in each division.

The last Legislature enabled the Tennessee Highway Department to stem the rush of private companies who sought franchises for toll bridges over large streams on important highways, which were served by toll ferries. These bridges, seventeen in number and at a cost of not exceeding eleven and a half million dollars, are now being built as state owned and operated toll bridges. They will become free bridges when the tolls have amortized the bonds issued for their construction. The tolls in most instances are fixed as low as one-half that of the ferriage charges at the time the act was passed. This forestalls the necessity of allowing private companies under franchises to build and operate bridges which are so expensive to construct that the State could not immediately include them in the program, leading later to the ultimate necessity of condemnation or purchase by the State. As an example of the income that may unexpectedly be derived from these structures, I would like to cite the toll bridge between Camden and Philadelphia, over the Delaware River, which cost twenty-six million dollars and was anticipated to be a losing financial venture for several years, but which actually paid all operating costs the first year and over and above this returned six per cent of the investment.

We have no assurance as to the ultimate amount of travel we may expect on our highways. According to the President of the American Automobile Association, in 1926 passenger automobiles travelled ninety-six billion car-miles or two hundred forty billion passenger miles as compared with Class 1 passenger trains, which in the same period travelled five hundred fifty million train miles or thirty-five billion passenger miles. The automobiles were responsible for seven times as many passenger miles as the trains. We have only begun to travel by highways. Much will have to be done in highway traffic regulation to enable the roads built to our present standards to accommodate the traffic flow. The highways which we class as congested now are capable of carrying much more travel with greater speed and safety. The enforcement of a minimum speed regulation and the elimination of the concentration points will do much to help. The problem of highway safety cannot be passed lightly. Seventy-seven thousand American soldiers were killed in the World War; since the Armistice, one hundred eighty-seven thousand American citizens have been killed at home by the motor vehicle. Most of these accidents were preventable.

The highway problem, with its many phases, will be with us always. I have often been asked the question, "When will we have our highways completed?" I always reply, "Never."

## Nearly 60,000 Miles of Highway Improved During 1927

Nearly 60,000 miles of highways will have been improved in the United States during 1927 as a result of combined efforts of Federal, State and local agencies, according to Charles M. Babcock, President of the American Road Builders Association. During the past several years the mileage of improvements on the nation's highways has approached that figure, he said.

Mr. Babcock expressed the belief that the proved economy of secondary roads will lead to a new era of construction in sparsely settled and little travelled communities.

In speaking of the present objectives of the road building industry, Mr. Babcock stressed the need for the immediate closing of gaps in the Federal Aid Highway system. "These roads," he said, "are essential to an unhampered economical system of highway transportation. Transcontinental and interstate primary highways must be completed in order that the nation may receive a maximum benefit from its road system.

"Already the United States has a larger mileage of improved roads than all other nations combined. The country possesses nearly 80 per cent of all automobiles in the world, with registration still climbing. In a very few years the country's highways will be inadequate to handle the traffic if construction is not continued and increased.

## Waterproof Cement

Material such as cement or its constituents such as sand, slag, ashes, shale, clay, gypsum, coke, bauxite or pyrolusite or mixtures of these ground to a fineness of 10,000 mesh is added to Portland cement or unground clinker. Solutions containing alkaline lyes, carbonates or chlorides, magnesium chloride and lime, mineral acids, oils, fats, bitumen or albumins or degradation products of the last may also be added. Ciment Portland Artificial de Pont. a Vendin (French Patent 612,129).

# PURCHASING AND ITS RELATION TO INDUSTRIAL PROGRESS

By M. E. Towner,

General Purchasing Agent, Western Maryland Railway Company*

DURING the next thirty minutes we are to consider the great exchange that is going on every minute of the twenty-four hours of the day, in the transfer from possession to possession of money for goods, labor or service. All activities of life are affected and our human contact is so adjusted that all must be benefitted or suffer in accordance with the equity of our transaction. The immutable "Law of Economics" is involved and its principle, "the exchange of values on a comparable basis," must be adhered to if economic and business progress is to be obtained.

Whether necessity or luxury; whether from mine, well, forest, farm, stream, ocean or air, the raw material or finished article must go through human hands. The article must be produced, purchased or sold and used.

Not one of us can name all of the items demanded for the comfort or needs of the human family. You find it surprising in your own business to note all of the industries you affect or that affect you. Your commodity is a necessity of the times.

The fact that you are assembled here today acknowledges not alone the importance of your line, but that it has problems which can best be solved through contact and discussion, and not alone the problem of production, but of marketing on a stabilized basis.

You are interested in the law of "Supply and Demand" and its stabilization; the reaching of and expanding of your markets; the equitable balance between your manufacturing costs and your sales price; the legitimate profit that should accrue and compensate you for your effort; the elimination of sharp practice. You are interested in obtaining and maintaining the confidence and good will of your customers, and to do so you must have an understanding of their requirements and meet them satisfactorily.

You know full well that quality of product has its bearing on the entire transaction, and you have the right to expect and demand from the user recognition of your efforts, with a fair and intelligent understanding of your business and goods, and a realization that equity cannot be maintained where a fair profit is not subscribed to. Where unusual and more or less arbitrary demands are made, particularly by the user, and causing extra costs to the producer, the user should pay for such extra service rendered.

As time has passed our population has increased, and with such increase the problems of living and of industrial growth have multiplied. We have reached a stage in our national life and growth where the small industry has been supplanted by great consolidations, with far flung power and effect. They must and do have a great bearing upon the weal or woe of the human family and its dependents.

In the conduct of these great industries, practically all human abilities or talents are in demand and used. Within the organization there must be those who are qualified, by talent and experience, to expend huge sums of money for materials;—raw, semi-finished and finished. Let us again realize that organized effort must be of the highest order of intelligence and practice if business and human progress is to go on satisfactorily and not be retarded.

Our National Government, through its census authorities, gives an estimate for 1926 as follows:

Value of goods on shelves at the end of the year.....45 billion
Total value of factory products.....72 billion

These are staggering figures, almost beyond our comprehending, and yet we must add to these the exchanges in other lines where professional or other service is rendered, the value of same expressed in another huge total.

As interesting as the above figures may be, it is equally interesting to know and to acknowledge that all industry is related through the force of contact and dependence. The relationship is defined for all time in that immutable law we have mentioned —"The Law of Economics."

Business progress cannot be based upon destructive methods. One industry cannot legitimately seek to destroy another, either of like or unlike kind. The economic principles of supply and demand may cause the elimination of too many organizations, and legitimately so, but such course of action does not recognize nor justify the unsound practice of putting others out of business through unfair methods.

In the conduct of modern industry, those governing the purchase of requirements must contribute their share to good management, sound practice and express intelligence and genius. They must qualify in ability, experience and honesty, and be students of business conditions. They must understand the meaning of ethics and economics. Whether limited or unlimited in the authority granted by business heads, no buyer has any au-

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thority to be other than intelligently fair and to so express himself by finding and dealing with facts in a fair and equitable manner. His greatest authority is found in doing the right, just and equitable thing.

Intelligent buying must subscribe accurately to requirements and to the use of materials, so that stocks may be used up or turned over in the shortest possible time. Cycles of business depression have been largely caused or contributed to by buyer or manufacturer accumulating for use or sale large stocks which are far beyond requirements and cannot, for months and sometimes years, be liquidated by use or sale. Money thus tied up becomes inactive and non-productive. The law of supply and demand is tampered with and industry slows up.

When business is good, let it remain good by meeting demand promptly but do not, in the accumulation of stocks, go far beyond in absorbing point. You know full well that your industry must keep its product moving if you are to operate at a profit. As those who contact and sell goods must know their markets, so must the buyer know his sources of supply. The buyer who subscribes best to modern business progress must recognize certain principles, avoid certain practices and extend that form of business courtesy and interest which established confidence. Let us consider the following:

## Ethics

which is—"The science of right and right conduct." Recognition of ethics eliminates sharp practice or the gaining of lower prices through playing one company against another, especially during stress of competition, and by getting such company or companies who are already low in price, to cut still lower by making mis-statements to them as to prices already submitted. It may be true that several bids are received and none of them considered in line with market conditions. It is fair to reject all and ask for new bids, putting all on a comparable basis. No progressive buyer will do this unless he knows it is fair and consistent with market conditions.

## Contracts

Contractual relations must, on many commodities, be arranged quarterly, semi-annually or annually, thus establishing for the buyer favorable sources of supply, and for the manufacturer, as nearly as possible, knowledge of his customers' requirements, and that he has a market for his output. Such arrangements certainly help the manufacturer in keeping down his costs and his industry running on an economical basis. A contract, in terms of expression, should be clear, as simple as possible and thoroughly understood by both parties. The hardest contract to break is the one which states clearly and equitably the understanding arrived at by both parties.

## Specifications

The value of specifications is in a clear and complete declaration of what the buyer requires or what the manufacturer has to offer and guarantees to furnish. In the main, it is not up to the buyer to tell the manufacturer how to make his goods, but both working together can mutually, through the medium of specification, declare what is to be bought and that it can be so manufactured and furnished.

## Simplification

The United States Department of Commerce, Division of Simplified Practice, has in the last few years, through suggestion and leadership, made it possible for buyer and manufacturer to get together and eliminate many unnecessary sizes, shapes, styles, analyses, formulas and specifications which only complicate business and add to expense. There is much yet to be accomplished. I am thinking of a commodity which, on inquiry as to specification, developed thirteen specifications in the same territory of manufacturing and purchase, and for the same purpose of use.

## Prices

Considering first that all other considerations, quality, etc., are equal, we can state that—those who buy best and to the best interest of all concerned are not always those who accept the lowest price offered. In fact, the low price may not be low enough, or paradoxically, it may be too low. Those who own or manage a property may question seriously a buyer who does not accept the lowest price. He may be able to show them two or three things—

1st—That with, we will say, ten bids, no price offered is low considering all conditions, or, if you please, low after fully analyzing cost and allowing for a fair profit.

2nd—That seven or eight of the ten show reasonable price uniformity, are found to be in line with general market conditions and related commodity prices, and from the standpoint of quality, reliability and general service rendered, an acceptable price for the commodity. The other two are markedly or inconsistently low, subject to real question as to acceptance, and in many cases can be rejected.

3rd—That the real danger to the industry is that their buyer can just as easily, if not thoroughly qualified, accept a low offered price that is too high as he can accept an unjustifiably low price.

In correctly considering these three examples, a buyer must be experienced keenly alert and intelligent, actuated by the best business principles and motives, and have sufficient knowledge backed up by records, if he is to fairly well figure the worth of the commodity at the time of purchase. This does not prevent his taking advantage of bargains

when legitimately offered. It is true that, through unusual effort or by new process or practice, one manufacturer may be able to legitimately undersell others. This situation can be made clear to a buyer and and he will correctly trade with such manufacturer.

Very often there are those who, with improper knowledge and viewing from the angle only that certain ones are doing well in a line of business effort, seek to enter the same line, overcrowd the market and also establish, mainly through lack of knowledge of manufacture and cost, prices which are only momentarily of advantage to the buyer, and, in reality, unsound and uneconomic in the long run.

There are commodities on which prices are all quoted alike or substantially so. Some call this price fixing, and some, stabilizing prices for the benefit of industry. There are times when such action is needful as one of the acts of stabilization. When such prices stand up under the close scrutiny of expert analysis; do not block nor hamper competitive effort; do not bring on manufacturing complacency, or stop one or more mnaufacturers who are able, through new process or discovery, to manufacture at lower costs and sell advantageously at lower price, to do so, then the buyer and consumer can have very little complaint to offer. No expert buyer will, however, pass over without challange the condition shown, when all or practically all manufacturers of a given line bid alike.

### New Devices or Inventions

The rapid evolution in business, particularly in some lines, notably electrical, as expressed in improved device, calls for alertness and research on the buyer's part. Your industry feels the effect of modern appliance and practice. Great strides are being made in increasing output and lowering costs. No buyer can lag behind in assisting his company to take advantage of this situation. Patented articles at seemingly very high prices, considering manufacturing cost, must be dealt with and a fair price sought, but the buyer must not overlook the economic value of the device to industry, nor discourage or stifle inventive genius by denying the right of special return for the discovery, especially considering what may have gone on prior to its perfection and use. The period of patent protection may not be overly long nor the profit or period of profit any greater than should be.

Many other things could be mentioned and dwelt upon did time permit. In closing I would like to mention that, while great improvement in both buying and selling methods has been made, there is yet much room for improvement in—

(a) Both using the other's time to advantage.
(b) Eliminating needless felicitations.
(c) Getting down to business promptly.
(d) Soliciting bids clearly, concisely and completely.
(e) In answering those bids without ignoring one or several questions asked.
(f) In asking for and conducting only necessary tests.
(g) In eliminating the personality method of sale and substituting real ability and knowledge.
(h) In the buyer being thoroughly conversant with his company's commodity needs.
(i) In eliminating all emolument, especially season—and
(j) On the part of the buyer, the elimination, to the fullest possible extent, of waiting time for salesmen.

## Chemical Uses of Gypsum

Gypsum is successfully used in the manufacture of sulphuric acid by the contact process. A mixture of gypsum, silica, alumina and coal is heated in a rotary kiln, sulphur dioxide is evolved and cement clinker is formed. Gypsum is also used in the formation of precipitated calcium carbonate and ammonium sulphate, by passing ammonia and carbon dioxide into an aqueous suspension of powdered gypsum. Magnesium carbonate reacts with the herm-hydrate of calcium sulphate to form calcium carbonate and Magnesium sulphate. G. Gallo (Giorn. Chim. Ind. Appl. 9, 405, 1927 and B. C. A.)

## Corrosion of Concrete

Ammonia, hydrogen sulphate and oxygen form a mixture which corrodes cement, probably due to the formation of a sulphate. Sodium silicate used to bond the repairs was unsatisfactory and corrosion occurred at the bond. Barium hydroxide sprayed over the old surface gave better results. H. & E. Brintzinger (Tonindustrie Zeitung, 51, 1546, 1927).

## Clay-Water Mixtures

Wet clay is characterized by a considerable tensile strength, cohesion and impermeability to water as compared with wet sand of similar composition. These properties are considered referable to the fineness of division of the clay particles, which are sufficiently near the colloidal size to make molecular forces important. The smaller colloidal particles act as a cement and cover for the larger ones, and give the properties mentioned above. Clay particles settle from a fresh water suspension by the addition of sea salt which is three times as effective in producing coagulation due to neutralization of electrical charges on the clay particles, as sodium chloride. This effect is probably due to the presence of calcium and magnesium salts in the former, as alum is ten times as effective as sea salt. H. Chatley (Ins. Civil Eng. 1927, 52,3-17).

# BROKEN STONE COST DATA SUGGESTIONS

**Dr. George E. Ladd**

**United States Bureau of Public Roads***

AN EDITORIAL in a recent issue of the Saturday Evening Post refers to and criticises a Treasury report which calls attention to losses incurred in various lines of industry. From this I quote as follows:—

"The worst showing was made in mining and quarrying where more than 70 per cent of the reported incorporations indicated losses." This statement is based on more numbers of individual units, and I hope that the larger units, as represented by membership in this Association, are outside of this great casualty list.

This brief discussion and the suggestions which I have to offer to your Association are confined wholly to the field of plant operations. If there is anything of value in what is offered, it is an easy matter for any operator to apply it to the more private matter of his overhead costs.

The making of a profit in this industry does not lie *wholly* (I emphasize that word), in the economies of large scale operations. It may be dependent upon many factors, especially that of the character and physical condition of the beds of stone or ledges which are quarried. Certainly under any circumstances, efficiency of operation is a vital factor, but there are many aspects to this word efficiency. Efficiency may be evident in some respects at a given plant, and entirely missing in other respects. Methods of operation must be adapted to given physical conditions which involve the nature of rock to be quarried, topography, and location, especially with reference to immediate surroundings, which for example may limit the magnitude of blasting operations. The layout must be economical. The lowest-cost available power must be used. Equipment best suited to the particular problem must be selected. The kind of explosive used and the spacing of drill holes must be properly related and both of them adapted to the nature and physical condition of the rock to be quarried, and the results obtained must also solve the boulder problem, with reference to size and quantity. Where many boulders must be broken, the cheapest method must be found, and a proper relationship established that is most economical, between boulder reduction, the size and character of loading shovel, delivery apparatus, and the size of initial crusher. Supervising employees must be capable and loyal. And, finally, labor must be handled intelligently.

How may a proprietor know whether or not in all respects his plant is being operated with maximum efficiency? Is he static and satisfied with existing methods and conditions at his plant, or is he dynamic and anxious for the ultimate in perfection, or as near an approach to it as practically attainable?

Bookkeeping and balance sheets throw no light on efficiency, but cost keeping will do so if a suitable and simple system be adopted, and if it be conducted by an employee who is both intelligent and conscientious. It has fallen to my lot to study quarry operation at various times from different points of view. Years ago I made extensive quarry studies for the states of Missouri and Massachusetts, and, after the war, prepared for the United States Bureau of Public Roads a bulletin entitled "Direct Production Costs of Broken Stone," which was published only a few months ago. In that bulletin, lies the answer to most of the important production problems of the broken stone manufacturer, or at least, the way is pointed to their solution, if he has the patience to dig it out. So much of value to the broken stone industry has been suggested to me by the fact contained in this publication, that it has been my hope to find time for another bulletin covering the lessons indicated by the work already done.

If any one has given careful study to the tables and accompanying data already published, it must be evident to him that something more important than the presentation of direct operating costs at certain selected quarries, was achieved. To me at least it is evident that the question of efficiency is brought out in nearly every detail of the report.

Of the 23 quarries studied all but 2 were under my personal observation for several summer periods. Observation was made of all the factors affecting efficiency of operation, together with a comparative study of methods, layout, equipment, physical conditions, labor conditions and management, etc. Nothing ever interested me more than the question of whether or not the ultimately obtained period-cost-data would bear out general observations made, and vindicate the opinion formed at various plants as to their efficiency factors.

Let me state at once that whatever praise or condemnation I had mentally awarded to any phase of plant operations was proved to be justified when daily reports had been assembled into weekly reports, and weekly reports into final reports for the periods of study. The cost data investigation conducted along lines of natural units of operation turned out to be an efficiency study. Doubtless any one of you would have known that it would be so. To me it was a pleasing revelation and all the more

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so because it testified to the accuracy of our field work and compilations.

In order to make clear various subject-references, let me refer to the plan I adopted for my Direct Cost Study, which seems to have been practical, simple and easily carried out.

As originally made, unit operations were selected as follows:

1. Stripping.
2. Breaking Face.
3. Breaking Boulders (all methods).
4. Pumping.
5. Loading and Hauling Waste.
6. Loading and Delivery to Crusher.
7. Crushing and Screening.

It was quickly found desirable to further subdivide these units, especially for a study which included numerous small-scale plants. Breaking Face was sub-divided into the two units—Drilling Face and Blasting Face. Breaking Boulders was subdivided into—Drilling Boulders, Blasting Boulders, and Sledging. Loading and Delivery to Crusher were made separate units, so that the natural units on which cost-data was obtained were finally as follows:

1. Stripping.
2. Drilling Face.
3. Drilling Boulders.
4. Blasting Face.
5. Blasting Boulders.
6. Sledging.
7. Pumping.
8. Loading and Hauling Waste.
9. Loading and Delivery to Crusher. (Details and Summary separately kept.)
10. Crushing, Screening, etc.

At quarries where steel-balling was practiced for the reduction of boulders, wholly or in part, a special study was made of that phase of operation.

Of course, all quarries do not need this complete list. Some may have no stripping to do; no loading and hauling of waste; no pumping; no sledging; and probably no breaking of boulders by the steel-ball method.

The selection of good forms for the recording of daily, weekly and final data was important and several were tried and rejected, before satisfactory ones were adopted. They include those for daily records, and for weekly and final assembly sheets, for each unit separately, and for all, collectively. Forms covering drill sharpening and rate of drilling were also used. Notes were kept on equipment and its condition and many phases of work were studied, down to the timing of laborers on various operations.

Some of the facts demonstrated by figures are as follows:

Power costs were lowest where electricity was used.

Machine drill-sharpening led to lower cost and greater efficiency.

With one exception, well-drilling, wtih drill operated by any form of power generation, resulted in the cheapest method of breaking face. The exception is where quarries were located in highly jointed trap rock and had especially high faces.

The higher the face blasted, the lower the cost of face-blasting.

In the case of two quarries which were studied in two consecutive seasons, the cost results were informative. During the first study one of them used well drills until stopped by injunction. They continued with tripod work. The second year drilling was all tripod. Cost of face drilling, per ton of stone produced, increased the second year by 15 cents. At the second quarry similar circumstances occurred, with a resulting increase of face-breaking cost of over 16 cents per ton of broken stone. In fact, the cost of breaking face, where tripod-drilling replaced well-drilling, was exactly doubled.

Where a good face was not left after blasting, especially where toes were left, the results showed up in face-blasting and face-drilling costs. Where an excessive amount of boulders resulted from poor blasting method, that is, improper explosive used, or poor spacing of holes, the error fairly cried out when the cost data for face-breaking units were consulted. Where hand labor was used for loading, and this was the case in part of two large-capacity plants, contract labor was more efficient in ton-loaded-per-hour, in the ratio of approximately three to two. Relative costs, of course, depended upon contract prices and labor wages. It was found that cost of face-drilling, and the rate-drilled per hour, varied directly with "Percentage of Wear Tests" made in our laboratory.

An important revelation was that a quarry which was studied in two consecutive years completely altered its plant-layout preceding the second study, and its Direct Operating Costs were lowered almost exactly 50 per cent by the change!

A comparative study of costs and conditions at four plants having a daily capacity of about 2,000 tons, shows the following total direct operating costs per ton, respectively:

$0.4242
0.2828
0.3471
0.3130

The highest cost in this group was at a plant where a part of the stone produced was from a pit, and a part of loading was done by both day labor, and contract labor. Also in blasting it produced about three times as many boulders for subsequent reduction, as were produced at the other plants.

By keeping records in terms of labor hours as well as simply labor cost, the whole labor situation becomes illuminated, as does, also, perhaps, the question of the ability and loyalty of foremen.

The next to the highest-cost plant used steam power instead of electricity at its crushing plant, and was of the pit type so that delivery to crusher involved hosting and extra expense. The unit costs in each case coincided with conditions.

The above statements show clearly enough how satisfactorily unit costs enable an owner to see at once where trouble lies if there be trouble. Perhaps it can be remedied and perhaps not.

It seems evident that if a group of plant owners would conduct a natural-unit system of keeping direct operating costs for a year or two, they could exchange results to the mutual advantages of all concerned, or if they choose, give valuable information to the industry at large. To make such a study most useful, conditions at each plant should be described.

In order to emphasize the significance of data obtained through correct keeping of natural unit direct production costs, let me call your attention to a few comparisons made in different units as between plants operating each at approximately 2,000 tons per day, and in practically the same kind of stone. At one of them drilling-face cost 3¾ cents per ton of broken stone produced. At the other 2¾ cents. Assuming operation for 300 days in the year this slight per ton difference amounts to the sum of $6,000 per year.

The cost of blasting a face at one quarry was $0.0616. At the other $0.0441, a difference of cost per ton for blasting of 1¾ cents. This makes a difference for a year's operation of $10,500.

One of these quarries spent 7¾ cents per ton of broken stone produced more than the other for the unit—boulder breaking. The difference in cost for the year's operation for this unit amounts to $46,500.

Suppose that you and your neighbor operating under similar circumstances discovered such discrepancies in cost, and through the unit system can tell just where the difference occurred. When you saw for example the item of $46,500 wouldn't you at once look into your boulder proposition and see first whether your drilling and blasting methods were properly adapted to your work, and, second, whether or not you were breaking boulders as cheaply as possible?

In regard to saving, as between the use of steam power and electricity, two plants owned and operated by the same company and in the same kind of rock, used, for crushing and screening plants, steam and electricity respectively. At the steam-operated plant crushing and screening costs were $0.1013. At the plant where electricity was used the cost per ton of product was $0.0630. Here was a difference in cost of nearly 4 cents per ton. The saving at the electrically operated crushing and screening plant amounted, in round figures, to $23,000 per year. Of course, ultimate costs per ton, as between the two methods, depend upon fuel cost and the cost per unit of electric power. However, in all cases studied, the advantage lay in electric power.

In this connection it should be borne in mind that relative cost per horsepower is not a dependable guide for a selection of method. In a study of southern cotton mill costs it was found that steam, per horsepower, costs less than electricity per horsepower, but that under operating conditions the cost per horsepower consumed in production was decidedly in favor of electricity.

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(*Continued from page 60*)

From the above it is apparent that the trend of vibrator screen design is toward the following:

Vibration of the entire screen cloth frame rather than just the cloth.

The use of anti-friction bearings if bearings are required.

Elimination of triple deck screens.

Handling of larger sizes of material than formerly.

The use of vibrating means that assures positive cloth travel regardless of load.

The adoption of a vibrating speed of around 1,800 per minute.

Greater ease of changing screen cloth.

Most of these tendencies in screen design are, I feel, in the right direction. I would like at this point to venture some personal opinions as to the features most desired in vibratory screens however before doing so I wish to make it clear that I am in no better position, and possibly not as good a position to pass judgment on the vibrator screens as many men in this audience. My personal conclusions are as follows:

1. That the throw or force of vibration with screen loaded should be such that the particles are not tossed off of the cloth more than 2 or 3 times the diameter of the maximum sized particles and that anything greatly in excess of this may be considered a waste of power and time and maintenance cost.

2. That for fine material a high vibrating speed and small force is desirable and for coarse material a lower vibrating speed and greater force is needed. Therefore, the need for screens having adjustable speed and intensity, or possibly a better solution would be the furnishing of one design of screen having high speed for fine material, and another having lower speed for coarse material, each design being adjustable as to intensity.

3. That no particularly great advantage accrues to either the rotary or reciprocating vibratory motion. It is true that the rotary motion if used in the counter flow direction on a given appreciable screen slope will cause the particles to come in contact with the cloth more times than if used with the flow.

# 1927—AN OUTSTANDING SAFETY YEAR IN THE PORTLAND CEMENT INDUSTRY

**By J. Alton Reitzel**

TEN cement mills operated throughout 1927 without a lost time accident. This record has never been equalled in the entire history of safety work in the cement industry. In 1926 only two mills were successful in completing a year's work free from accidents; two plants were similarly free from mishaps in 1925 and one in 1924.

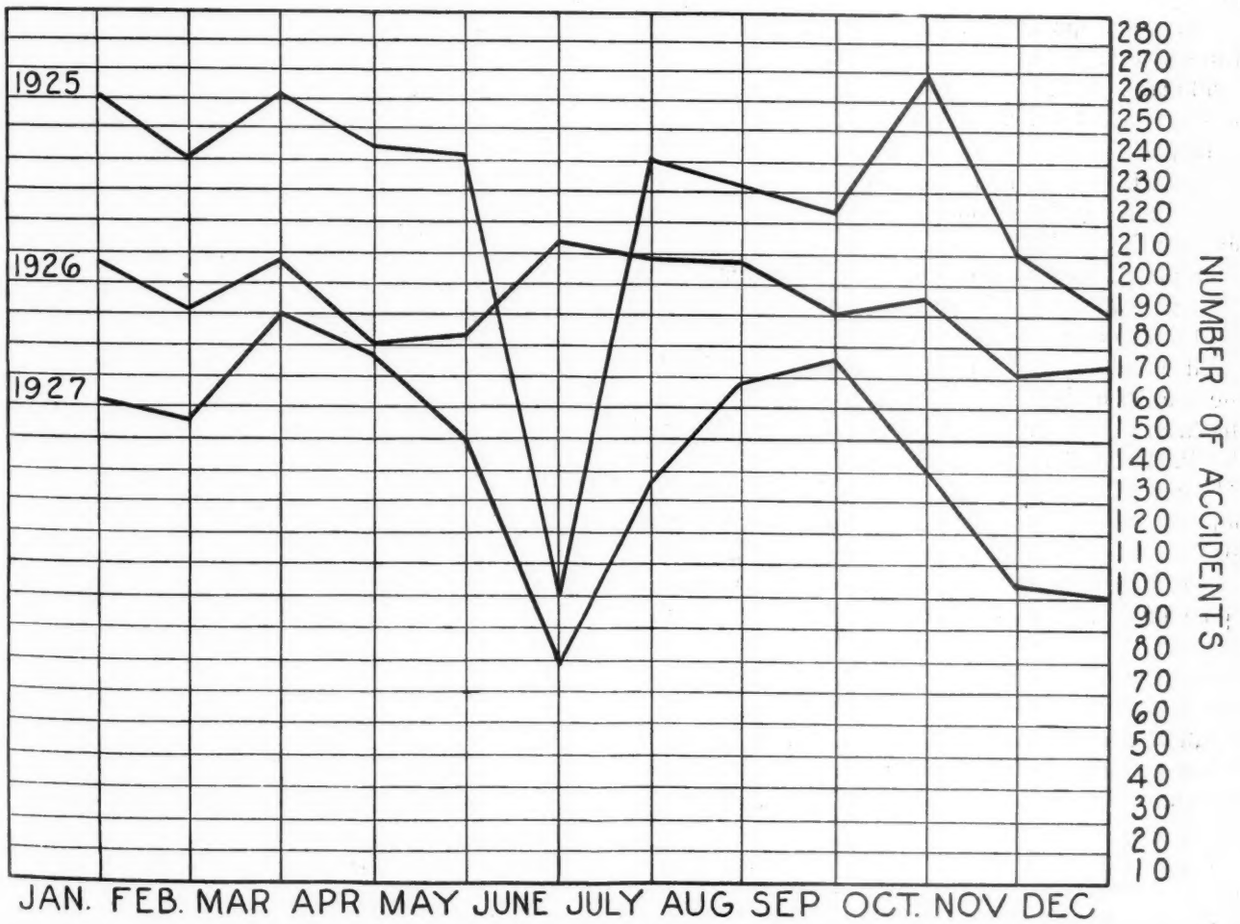
Each of these ten plants will receive the Portland Cement Association concrete safety trophy. The award takes the form of an eight ton sculptured monument, appropriately inscribed, testifying to the mill's record. These awards become permanent possessions of mills winning them; in case a mill repeats its record, additional inscriptions are placed on the trophy already in its possession.

Cement mills winning safety awards for 1927 are: Martins Creek, Pa., and Ironton, O., plants of the Alpha Portland Cement Co.; Belleville, Ont., and Hull, Que., plants of the Canada Cement Co.; Bonner Springs, Kans., mill of the Kansas Portland Cement Co.; Cowell, Cal., plant of the Cowell Portland Cement Co.; New Castle, Pa., and Iola, Kans., plants of the Lehigh Portland Cement Co.; San Antonio mill of the San Antonio Portland Cement Co.; and the Duluth, Minn., mill of the Universal Portland Cement Co.

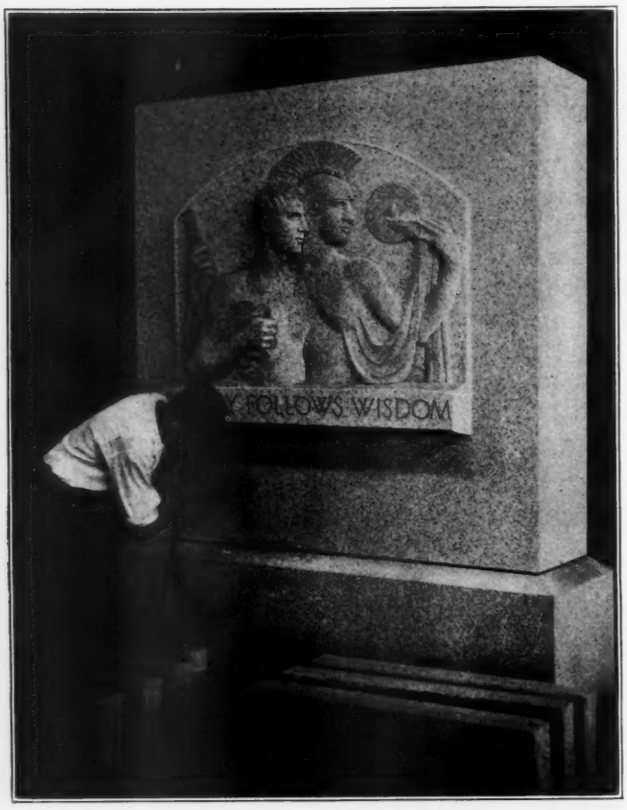
Among these are two organizations which have won trophies in previous years—the San Antonio plant in 1923 and the Duluth Universal plant in 1925.

A study of the accident chart showing the record for the past three years will indicate how intense the safety work has been during 1927. Every month during the past year shows a drop in accidents over the corresponding month in either of the preceding years.

As will also be noticed by the diagram, the lowest accident figure is in June. This is the month of the concentrated drive against mishaps, sponsored in both 1925 and 1927. In 1926, when the June campaign was not conducted, mishaps numbered 204. In 1925 the June figure was 92 and last year it was reduced to 68.




THREE YEAR ACCIDENT RECORD




The Safety Trophy

Here are some of the high-lights in the record for 1927:

133 mills operated during the entire month of June without a lost time accident.

50 plants of the above number had never attained a clear record during any previous month.

30 plants operated throughout January, February and March without an accident.

26 plants suffered no accidents during the first six months of 1927.

17 plants had no accidents in 10 months.

13 plants were without mishaps in 11 months.

10 mills completed the year to win trophies.

All member plants, then in operation, completed the month of September without a fatal accident, the first month without a fatality in the history of the Portland Cement Association.

These plants completed the month of June with but one fatal accident, which established a record for June and for all months up to September.

The following facts are noteworthy in connection with the Association's June no-accident compaign:

85 company executives supported the June campaign with their personal written pledges.

2,200 superintendents, foremen and safety committee men supported this executive action by making similar pledges and actively prosecuting the campaign.

33,000 workmen signed and returned individual pledge cards, promising to work without injury to themselves or others.

68 accidents were suffered—only 68 pledges out of a total of 33,000 were forgotten or disregarded, these amounting to about one-fifth of one per cent of the total. This record shows cement mill workers about 99.83 per cent alert and loyal—undoubtedly one of the best showings attained in any industry.

With nearly all of December accident figures reported to the Association it is estimated 1633 lost time accidents were suffered by the industry in 1927 and 30 fatalities. In 1926, 2,221 lost time mishaps were recorded with 34 fatalities.

While this reduction is startling in itself another factor enters which makes figures even more significant. The 1927 safety record represents the experience of 142 mills with a far greater hazard than is represented by the 1926 figures, covering only 124 plants.

Indications are that 154 mills will report their accidents to the Portland Cement Association during 1928. The Association keeps a fine statistical record of accidents—by the use of these figures a definite check can be kept on mishaps and steps can be taken for their elimination. For example, screw conveyor accidents recur each year at a certain period. By a study of the permanent record, efforts can be placed directly on this problem and effective safety work realized.

Plans for 1928 are already getting under way. No radical departures are to be inaugurated from methods used in last year's safety work. Two types of drives will be used—the co-operative and competitive.

The June no-accident campaign will be staged again this year. This type of co-operative scheme showed excellent results in 1927 and will be further developed this coming June. Under this plan every man co-operates with all his fellow workers—the record depends on the best efforts of every man in order that his mill may keep the safety banner waving from the flag staff.

Already bulletins and posters have been mailed plants enlisting them in the 1928 trophy contest. By this method every plant is in direct competition with every other to win the coveted safety award betokening a year of safe operation.

Although 1927 has been a banner safety year, A. J. R. Curtis, Assistant to the General Manager, Portland Cement Association, in charge of Accident Prevention, has this to say about the cement industry's accident effort: "We have had a good year —but zero is the limit with us; we will not be satisfied until every man in every mill is a safe worker."

## Cement Mortar and Artificial Stone

Portland cement, sand, crushed brick and 5-15% of fine slate powder are mixed together dry and then with water containing ¼ to ½% sodium silicate. The result is a concrete resembling stone in appearance. C. Pickstone (British Patent 279,355).

# THE CRUSHED STONE INDUSTRY ITS VALUE TO TRANSPORTATION

By H. O. Hartzell,

Executive Ass't to Vice Pres., Baltimore and Ohio Railroad*

RAILROADS are particularly interested in the handling of crushed stone which represents a very considerable volume of traffic, and while it is perhaps needless to call the attention to figures covering the production and movement of stone, nevertheless there are some features from a railroad standpoint, at least, which are interesting.

According to statistics compiled by the Bureau of Mines at Washington, there was produced throughout the United States, crushed stone aggregating about 68,000,000 tons in 1924, 75,000,000 tons in 1925 and 82,000,000, tons in 1926, which, during these three years represented approximately 66 per cent of the total stone production of the country. It is also interesting to note that crushed stone produced for use as railroad ballast during this same period aggregated some 10,000,000 tons in 1924, 13,000,000 in 1925 and 16,000,000 tons in 1926, or between 18 and 20 per cent annually of the total production of crushed stone. The value of the crushed stone produced for railroad ballast purposes averaged from approximately $8,800,000.00 in 1924 to $13,000,000.00 in 1926.

So far as the Baltimore and Ohio Railroad is concerned it may interest you gentlemen to know that our purchases of crushed stone for ballast purposes aggregated approximately 450,000 tons in 1923 to 496,000 tons in 1927, representing cost to our company of a little over a half million dollars per annum.

Shipments of clay, gravel, sand and stone over the Baltimore and Ohio Lines aggregated about 8,400,000 tons in 1925, 8,750,000, tons in 1926 and 7,000,000 tons for the first 9 months of 1927. Summing up the figures quoted above indicates, as before stated, reason why the railroads would naturally desire to cooperate to the fullest possible extent with the stone producers in the handling of their production.

In connection with the cooperation the railroads desire to extend to you, I would like to mention one department of our organization, which, I believe, can be of service. On the Baltimore & Ohio Railroad we have organized what is known as the Commercial Development Department, under the jurisdiction of the speaker. This department is composed of six bureaus, namely, Industrial, Geological, Industrial Survey, Engineering, Agricultural and Traffic Research. We feel it is possible for us to be of assistance to the shipping public, and particularly to those engaged in production of stone, through the medium of practically all of these bureaus.

For instance, our Industrial Bureau is charged with the work of locating on the system manufacturing plants, distributing warehouses, etc., and the handling of all matters pertaining to construction of commercial side tracks. It has been our pleasure to cooperate in past years with many of the contractors throughout the country engaged in business in the States we serve, in the location of their plants for the handling of materials entering into road construction, at the same time arranging for construction of necessary side track facilities to serve such plants, as well as quarry operations of various kinds.

Our Geological Bureau can, we believe, also be of material assistance to you. We have in charge of this bureau a Geological Engineer who has had a wide experience through his association with the U. S. Government, as well as some of the large steel companies. Through his effort studies have been made of the natural mineral resources on the Baltimore and Ohio system, placing us in position to give authentic information concerning deposits of clay, sand, stone and cement rock and other minerals. This Bureau has also prepared pamphlets on limestone, coal, cement rock, glass sand, clays and other minerals found on the Baltimore and Ohio System. It may be mentioned that studies made by this Bureau have been instrumental in opening up for development several large stone and dolomite operations on our lines and we have had expressions of appreciation on the part of those now operating these deposits for the services rendered them.

Our Engineering Bureau, as can readily be understood, may be of considerable service to those engaged in the stone business contemplating opening up operations on our lines, as well as to contractors engaged in road construction through preparation of plans to cover side track construction to serve such plants as they may desire to locate.

Our Agricultural Bureau is particularly interested in the operations of the limestone producers and we believe has been of assistance to them. It may interest you to know that during the year 1923, in cooperation with the State Colleges and producers of limestone, the Baltimore and Ohio operated for educational purposes the first soil improvement special train, since which time a total of seven specials has been operated through various states on

*Presented Before the National Crushed Stone Association, January 19, 1928.

our lines. These trains were operated with a view to stimulating use of limestone as a fertilizer. The trains consisting of exhibit cars, lecture coaches and sleeping cars for use of those in charge, were accompanied by soil representatives of note as well as representatives of the various State Agricultural Colleges who lectured to assemblies of farmers concerning the use of limestone for the purpose mentioned.

Farmers were requested to bring to these trains samples of the soil from off their farms which were tested by the officers of the State Colleges, who in turn gave the farmers a prescription outlining attention which should be given the soil with a view to improving conditions. Our records show that on the seven soil improvement special trains operated there were tested approximately 14,000 soil samples and a total of 231 carloads of liming material were distributed to the farmers for demonstration purposes, thus permitting each farmer to conduct a lime experiment on his own farm and prove to himself whether or not the recommendations made to him in writing by the soil improvement special were worthwhile.

That good results have been secured through this cooperation on the part of the railroads with the State College authorities and others interested is evidenced by the fact that on the Baltimore and Ohio the carload traffic of limestone over our lines from 1922 to 1926 has increased from 289 carloads to 2,011 cars, an increase of nearly 600 per cent in five years' time.

It is our belief that the Bureaus mentioned above can be of service to you gentlemen from time to time and it will be our pleasure to have you call upon us.

At this point it would also seem proper to mention the question of railroad service. As you all know, prior to the War there were frequent periods of car shortage, very materially affecting operations of both the industries and the railroads. Since return of the railroads to their owners at conclusion of Federal control, this situation has very materially improved and during the past few years car shortages have been practically unknown. This has been brought about through coordination of the railroads with the Car Service Division of the American Railway Association in part, and through heavy investments on the part of the railroads throughout the country and purchases of equipment—cars and locomotives—construction of additional tracks and of larger terminals. Such purchases over a period of the last five years having aggregated some three quarters of a billion dollars annually. In order to continue the purchase of equipment necessitating the expenditure of such a large sum each year the railroads must necessarily have good credit so as to be in position to place their securities. This credit, as you all know, can only be secured through satisfactory earnings on the part of the railroads and while five and three-fourths per cent has been fixed by the commission as a fair return to the railroads it is interesting to note that as a whole, or by rate groups, the railroads have not been able to earn that amount. In the opinion of leading railroad executives of the country, it will be necessary for the railroads to continue spending at least this amount each year to keep equipment up to such a point that the shipping public may receive entirely satisfactory service.

In the face of these large expenditures for equipment and improvements, also increasing costs of labor and materials, as well as the heavy payments for taxes by the railroads, which during the year 1926 aggregated $389,000,000, an increase of 239 per cent over payments made in 1911, attention must be called to the fact that rate adjustments made during the last six or seven years have all been on a downward scale, which it is feared, if continued, might have a decided effect on the service the railroad would be in a position to offer the public. Certainly with the railroads' revenues being constantly diminished, in the face of increased costs of operation, as mentioned above, it is going to be difficult for them to meet the situation without an effect on service.

It is gratifying to note the very splendid cooperation offered during the past few years by the shipping public to the railroads, which is highly appreciated. It is particularly gratifying to note the recent absence of radical legislation and it is felt if left alone the railroads, who have marked out a course and followed it successfully during the past seven years, having handled in 1926 the largest volume of traffic ever moved in any one year, can continue to give good service as long as that situation continues.

It has been announced that Senator Brookhart of Iowa is framing a bill for government ownership of railroads, which he claims will have the solid support of the progressives, whoever that term embraces. He made a significant statement in connection with this proposed measure, that it would have powerful suport from an unsuspected quarter. Perhaps he referred to bond holders to whom he proposes to give tax free government bonds in exchange for their railroad bonds. At this they would no doubt be very delighted were it not that the Senator indicates he will squeeze the value of the railroads down to 12 or 15 billion dollars. In that squeezing process he could hardly expect the stockholders to suffer all the punishment. When the bondholder learns just what the Senator has in mind he would probably demur.

One other Senator has suggested that the railroads be given another chance. A chance to do what. Never was the railroad transportation service as dependable and efficient as at present. All that is the matter with the railroads today is that they can handle and need more business.

# SEPARATE SIZES OF COARSE AGGREGATE FOR CONCRETE

By R. T. Giles,

Chief Engineer of Concrete Control, Blaw Knox Company*

THE subject of separating coarse aggregate into several sizes for the manufacture of concrete is of extreme importance and is rapidly attracting more and more attention. The need for this refinement in the manufacture of concrete is not, as some seem to believe, from the fact that the quarries do not produce and ship the proper sizes to give the desired gradation. The need arises from the segregation which takes place in the handling of the material after it leaves the quarry and before it enters the concrete mixer.

A few examples of this segregation and how it occurs will illustrate the point: On a large construction job the materials were assembled before the actual concreting started. The contractor installed modern equipment to control the cement, the sand and the water. The coarse aggregate had been stored adjacent to the proportioning plant in one large stock pile. As is inevitable in such cases, the coarser particles remained on the outside of the pile, while the core contained the small particles. When a batch containing the coarse particles was mixed, the consistency of the concrete was of such a wet nature that the sand and cement would run away from the coarse aggregate. On the other hand, when a batch containing mostly small particles was mixed, the concrete was of such a dry mealy consistency that in some cases it was practically impossible to get the batch out of the mixer. By extreme vigilance on the part of the mixer operator, this condition was helped, but it was impossible to produce the highest class concrete under the circumstances. All the benefits which should have been derived from modern equipment were lost by the segregation of the coarse aggregate.

On a large job in Chicago, the engineer in writing up the job suggests that it would be wise for specifications to be written for concrete size coarse aggregate (¼ to ¾ inches) until such time as satisfactorily graded stone could be secured. Such a suggestion as this was caused by the inability to secure coarse aggregate of a satisfactory gradation. If a suggestion of this kind should actually be carried out, the effect upon the quarry industry can easily be evaluated.

An experience on a road job several years ago will illustrate how segregation in its worst form can occur. The coarse aggregate actually entering the mixer might have been thought to have been separated into sizes due to the segregation which had taken place in the handling. Observation of the material at the producing plant, as it was loaded, showed the material to be satisfactorily graded as it entered the cars. Upon investigation, these were the conditions found: The material was loaded from the bin into the car by chutes with the usual small amount of segregation. All the cars, which were hopper bottom, were delivered on a trestle at the unloading point. The material flowed through the bottom of the cars to a bin under the trestle and from the bin into trucks to be hauled to a stock pile at the job. When this material entered the mixer, the segregation had so changed the appearance and utility of that material that it could hardly be recognized as the same material which had been loaded at the producing plant. While this is an unusual case, it illustrates the point and gives a picture of what happens to a greater or less degree on every concrete job.

No doubt many of the producers feel that, since it was not the producer's fault, he is not interested. Let's consider what happened and see if the producer is interested: Either next year or very shortly afterwards the maximum size of coarse aggregate for roadway work was reduced from 2¾ to 2¼ inches. This change was not, of course, the result of the one job cited, but was due in large part to results caused by segregation.

There is another angle from which the producer is vitally interested, and that is rejection of material after it arrives on the job due to improper grading, and excessive dust. With stone shipped in three sizes, the possibilities of rejection from improper grading will be nil. Under present conditions, if three cars were shipped containing excessive dust, all three cars would be rejected, whereas if the same stone were shipped separated into three sizes, all the dust would most likely be in the car with the small stone, and that one car would be rejected.

Just recently there appeared an article showing the saving by designing a mix for the use of local material on a roadway job. This material did not meet the specifications, but by the addition of more cement the local material was used and a considerable saving was the result. The material was deficient in large size particles. Had separated aggregates been required in these specifications, the contractor could have used his local material and supplied the deficient sizes from commercial plants. By this method, specification material with no additional cement could have been used. The saving by combining the local material with the commercial material would have been as much, or more, than

*Presented before the National Crushed Stone Association in Convention, January 18, 1928.

with the use of local material and additional cement. If this procedure had been followed, the commercial plants would have furnished approximately fifty per cent of the coarse aggregate on this job, whereas under the procedure which was followed, the commercial producer lost the whole job.

There will at all times be the competition of local material. Wherever it is economical it should be used, but by the encouragement of separated sizes of coarse aggregate, the deficiency will be filled by the addition of the proper sizes of aggregate instead of by the addition of more cement.

It might be well to consider some of the methods now in use to prevent segregation.—California requires the coarse aggregate to be shipped in two sizes and definite amounts of each size measured before entering the mixer. Iowa, as I understand it, has reduced the maximum size and requires that stock piles be built in layers and limits the height of the stock pile,—other States have done likewise and while this no doubt helps the situation, it does not correct it.

The most satisfactory specification along this line is that used by the State of North Carolina for some special experimental jobs now under construction. As before stated, the maximum size allowed in North Carolina is 2¼ inches. Unfortunately, it was not thought practical to allow a larger size for this particular work, as it was feared that some of the producers would have jobs under the special specifications and under the regular specifications at the same time. In such cases, a maximum size of 2¼ inches for one specification and 2¾ or 3 inches for the other specification, could cause considerable trouble.

Should the experimental work now under construction under the special specifications in North Carolina prove satisfactory, it will of necessity be of interest to the stone producers, and for that reason a brief outline of these specifications is given here:

In spite of the fact that a 1-2-4 mix was regularly used for roadway concrete, it was felt that by using inundation to accurately control the fine aggregate and to separate the coarse aggregate into three sizes and measure each size, the mix could be increased to a 1-2-4.65 and a concrete of suitable workability secured. This has proved to be the case. The idea in resorting to such a specification was primarily economic, and unless a concrete equal in value to the concrete obtained under the 1-2-4 mix is obtained, there will be no economic advantage. Had the maximum size of the coarse aggregate in these special specifications been increased to 2¾ or 3 inch at the same time that the mix was changed from 1-2-4 to 1-2-4.65 it is possible that even a better quality concrete might have been secured than that of the old mix.

By increasing both the size and volume of the coarse aggregate, using the same cement and fine aggregate, the fineness modulus of the aggregate is increased and a stronger flexural strength concrete should be secured. If the flexural strength will be increased by the increase in the fineness modulus and at the same time a concrete be secured which will absorb less water, it is hardly conceivable that this idea and these principles will not be followed, though perhaps not in the exact form now being tried out.

Should this idea prove its merits, it seems reasonable to suppose that it will be included in other specifications. In this case, quarries will more than likely be asked to furnish stone to be measured in separate sizes.

There is no doubt but that a specification as outlined would cause some little disturbance in the operation of a quarry, but where once the necessary changes had been made, the benefits should greatly offset the temporary disturbance caused at the quarry. If a successful method can be found to use larger size coarse aggregate for roadway concrete the aggregate producers will receive a larger benefit than any of the interested parties, except the general public.

The increase in the maximum size aggregate from 2¼ to 3 inches would increase the production a considerable amount with no additional crushing expense. It also would reduce the percent of screenings in relation to the output, and this material is as a rule the least desirable aggregate produced.

## Waterproof Concrete and Mortar

Waterproof cement mortar and concrete are obtained by substituting fine slate flour for 5-15% of the usual aggregate, adding ¼-½% sodium silicate of 50-55 degrees Bé to the gauging water.

C. Pickstone (British Patent 279,355).

## Preparation of Mortar

Freshly burned, still hot lime is mixed and ground with damp trass, other volcanic tufa, damp slag, etc., under steam pressure. The mixture is then heated until all the water of hydration is removed. During the steam treatment the setting strength of the mortar is much increased.—A. G. für Steinindustrie and W. Braun (German Patent 428,431.)

## Artificial Marble

An artificial marble consists of the following ingredients: 5 lbs. calcined magnesite, 1 lb. of powdered asbestos, 1 oz. of alum, 1 oz. of saltpetre, 2 oz. hydrated lime, 2 lbs. of casein, 2 oz. of glue and sufficient sand or ground stone to form a suitable paste. Pieces of pearl or thin substances may be inserted in the molding.

H. L. Bates (British Patent 278,983).

# HOW AN AGGREGATE ASSOCIATION CAN COOPERATE TO ASSURE FURNISHING SPECIFIED MATERIAL

By H. S. Mattimore,

Engineer of Materials, Penna. State Department of Highways*

IN HIGHWAY construction as in well controlled construction of all kinds, crushed stone is purchased under specifications. The producer in accepting the order obligates himself to furnish material which will meet the requirements. From this standpoint, naturally the purchaser expects this as a matter of contract agreement.

I would not be surprised if the above premise is an old story to individual producers, in that, engineers, as a class, respect their specification requirements, and, as a general rule, insist that the contractor and producer are required to meet them. When materials are received on important work, which does not meet the specified requirements, it is an economic loss for all parties concerned, there, cooperation to correct the occurrences of this condition should be a profitable undertaking for an individual producer or an association of producers.

From the number of trade associations formed within the past ten years, we are justified in calling this an age of association. This uniting of efforts along various lines is advantageous to the individual producer, or the assocation would not survive. It can be readily seen where considerable advantages can be gained by skilled advertising, intelligent promotion, and expert supervision of investigation, to solve general producing problems, or increase the market for the product. These are worthy motives for the uniting of efforts, if performed in an ethical manner, and will have the respect of all engineers supervising construction. Furthermore, I believe these engineers will readily cooperate with an association of this kind, if they are assured that the problems will be approached from an engineering standpoint.

Crushed stone, as received at destination, is tested for grading, and examined for cleanliness, foreign coating, excessive coating of stone dust, and existance of objectionable material, such as shale. If the material does not meet the specified requirements, the engineer or inspector has no alternative but to reject the material. We know it is commercially possible to produce and furnish stone to meet certain specification requirements, from the large tonnage received which is acceptable.

Inspection of different quarry faces and crushing plants furnishes considerable information relative to the sources of these rejections, for instance—quarry faces with mud seams usually explains causes for dirt coating on the crushed product, especially if it is prepared during wet seasons. Care in selection at such plants may remedy this condition to some extent, but the real cure is to wash the product if constant production of acceptable material is to be maintained. Crushed stone washing plants at some sources must be an economic procedure, as one large corporation I have in mind, after having tried the process at two plants, are now preparing to install the third one. This company is one that I know has made a detailed study of costs, and is in a position to demonstrate the practicability of such installations. Another cause for dirty stone is careless stripping, although this is not a general fault in well run operations, it still exists in plants which, along other lines, seems to be run on a business basis.

There are many causes for poorly graded material. This may be caused by improper spacing of crusher jaw to produce the required sizes, improper screening, due to the length or pitch of the screen, and finally segregation in loading. I realize these are preliminary details which are, or should be, familiar to all producers, but we do know that they are not always well regulated, judging from conditions encountered when inspecting plants, and I might state further that such faults are not characteristic of the small producers only.

These conditions stated above, which are causes for rejections of the finished product, generally accompanied by a financial loss to producers, and at least, delays to the constructors, should be corrected as a straight business proposition. It certainly is not good business to depend entirely upon the construction inspectors to rectify them.

It may be relevant at this point to discuss briefly, inspection at source versus inspection at destination. I realize inspection at the plants is favored by many producers, in that, at least some of them assume that this system would relieve them of considerable responsibility. Under some conditions, inspection at the source is feasible and apparently works out well, but such inspection is especially applicable where the large majority of shipments is confined to a few sources. In a State like Pennsylvania, where 135 crushed stone, and 82 sand and gravel producers are furnishing some quantity of material for Highway work, inspection at source has been found impractical. Producers in the State realize it and are assuming responsibility for furnishing proper materials, many of them having assigned their own inspector to sample and test material prior to shipment.

Getting to the meat of our subject just how an association of this kind can cooperate to assure

*Presented before the National Crushed Stone Association, January 18, 1928.

quality aggregates—in the first place—in order to protect the association and the best class of individual producers, some quality requirements should be necessary for membership. Inspection should be made relative to the source of supply that the proposed member is to work, the efficiency of the plant relative to producing the desired material with general investigation of his business integrity. You can readily see how a requirement of this character would tend to raise the status of any organization.

The association should have a sufficient force of technically trained men to advise producers relative to installation of screens of proper sizes, and general correction of conditions in the quarry or plant which affect the finished product. Don't confuse this with so-called trouble shooters sent out by producers to examine a product at destination which has been rejected. Make provision to prevent rejection by investigating the trouble at the source.

You have already, or are just about to establish, a research laboratory and organization. This is an excellent move, and eventually should prove a profitable one, but remember, research is not a procedure that produces overnight results, as problems are solved, or new uses for material are initiated in the laboratory, provisions should be made to see that facilities are available to put them into practice. Many excellent ideas in the use of material have been discarded, due to improver supervision of the application. For instance—different types of stone roads in some localities have been condemned. Is this due to poor construction or to the type of road? Perhaps thorough investigation might show that the limited field for bituminous penetration macadam has been caused to some extent by improper materials or poor construction.

To quote as example along this line, the Portland Cement Association, in recommending concrete surfacing, foresaw that poor construction might condemn this type of road, and they made provisions to supervise inspection of construction to avoid this. There is no question of doubt but this procedure was a large factor in the great favor which this type of road is receiving at the present day.

We have heard considerable talk relative to standardization of specification for stone sizes. Probably there is a field for this within limited areas, but from a production or any other standpoint, I can see little or no advantage, in fact it may be a waste of effort to try to obtain national standardization. In some type of construction, stone grading should be governed by stone quality. The main economic gain to be obtained by standardization, would be in the case of the one producer furnishing material to several different organizations.

I have aimed to give you the viewpoint of engineers who have the responsibility for quality construction in public work. The producers also have their responsibilities which they must assume. Aggregate production should be placed on such a high basis that there should be little or no necessity for construction engineers or inspectors to advise you relative to plant methods to produce specified materials. Expert advice of this kind could suitably be considered a field for the association.

Definite practical specifications, intelligently interpreted with fair, skillful inspection on the part of construction engineers, accompanied by skillful plant operation in preparing materials from suitable sources, on the part of the producer, is the basis for real cooperation.

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## Fused Aluminous Cement and Phosphates

In the blast furnace volatilization of phosphorus, the production of by-products has a great economic importance. One of these is fused cement. A patent application exists having the following specifications: Three to four tons of "Bauxite" cement is obtained from each ton of $P_2O_5$. For each ton of low quality bauxite, selling at about $5.00 per ton, one ton of high quality cement costing about $10-$12 per ton is produced, which has a market value of $30.00 per ton. With an expected production of 200,000 tons of phosphate by the blast or electric furnaces in Germany, a production of 6-800,000 tons of the aluminous cement may easily be expected. The reactions which occur in this process are as follows:

1. Reduction of phosphate by coke with the addition of silicic acid,

$$Co_3(PO_4)_2 + 3SiO_2 + 5\,C = P_2 + 3CaSiO_3 + 5\,CO$$

2. Burning of the phosphorus with air,

$$P_2 + 20\,N + 50 = P_2O_5 + 20\,N$$

3. Reaction of the pentoxide with steam at high temperature with the aid of catalysts,

$$P + 4H_2O = H_3PO_4 + 5H$$

Then follows neutralization with ammonia or caustic.—W. A. Dyes (Chemiker-Zeitung, Dec. 17, 1927.)

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## Light Aggregate for Concrete

Sawdust, shavings, wood and similar materials are prepared for use as a concrete aggregate by healing with steam under pressure and impregnating hot with salts which crystallize in cooling and expand the pores of the material. Insoluble precipitates may be formed by double decomposition such as the use of barium hydroxide followed by zinc sulphate, which combination results in the formation of zinc hydroxide and barium sulphate in the pores of the metal. Many other combinations may be employed forming insoluble compounds in the pores. Preservative salts, may also be used.

J. R. Garrow (British Patent 278,788).

# PROFITLESS PROPERITY

By E. St. Elmo Lewis

Counselor in Trade and Consumer Relations, National Service, Inc.*

PART II.

PART one of this interesting paper appeared in the last issue of Pit and Quarry. The fundamentals of the present position of the aggregate industries, hunches, guesswork, inspiration, researching markets, sales engineers, science in selling, mental attitudes and education of the market were discussed.

This article should be read by you thoroughly and then called to the attention of your associates. The viewpoint of an outsider with the background of Mr. Lewis is of importance to every company in the Pit and Quarry Industries.—Editor.

## Clarify Fundamentals

In order to clarify our standpoints, let us at this time, set down a few fundamentals:

A business is financed, a plant is built, and an organization is developed for the purpose of producing something that can be sold at a profit, *and then selling it.* Therefore the creation of an efficient selling process is the ultimate purpose of an organization, and if it fails there, the organization fails. The real cost of production is the cost of producing a profitable sale. The vital importance of the selling process is obvious. Selling a valuable, worthwhile service is the only reason why a business exists. We sell to a crowd of people that we call the Public. That Public doesn't have to buy of us. That Public is a peculiar thing. It is busy, fickle, indifferent, but exacting—with hates, prejudices, whims. We know less about this Public than we should. We do know, however, that:

(1) It is a fallacy that the public will automatically seek the best. Fashions prove this all by themselves.

(2) It is a fallacy that the public knows the difference between price and value. Stock market securities are an example.

(3) It is a fallacy that the public will automatically reward enterprise and service. The public must be told and sold before it will extend rewards.

(4) It is a fallacy that the public knows what it wants. It has to be taught its desires and needs except the most elementary ones.

(5) It is a fallacy that the public will demand over any great length of time what it is not constantly reminded of. Men die and forget: Men are born who never knew.

(6) It is a fallacy that value can be anything but "a personal estimate of desirability on the part of a buyer."

(7) It is a fallacy that the public will surrender its freedom of choice to any committee or board of scientific experts to determine what it should buy; or to say what are necessities or luxuries *without educational propaganda.* Remember the war; look at prohibition.

Therefore, we have advertising and sales departments with their educational methods.

## Selling Is an Essential Function

Selling is an absolutely essential function in all enterprises depending upon public support. During the next decade it will be the major problem of industry, because the solution of distribution problems has lagged behind production. It is a very human process, because, no matter how much sales may depend on price or quality and economic conditions, the sale is largely guided and controlled in any business by those qualities which I shall generalize under the cloudy phrase of "personality," which can tip the scale in favor of a particular firm or line of goods in many cases.

The public must be educated to know values; i. e., informed and instructed. You cannot ignore this necessary educative process. What does it matter what the price of an article is if I do not know I need it? It matters still less if I do not *want* it.

## The Problem of the Seller

"But I am doing this. I am educating my buyer," says the sales manager. Let us see if we can suggest some ways in which we might do it more effectively.

Having thus sketched the approach to the problem, and developed the clear indication that the degree and extent of the education of the market determines the demand, let us see how, in a definite sense, we should, in the light of the best merchandising experience, approach the problem of developing a market for a better product and stabilizing our business.

## Questions of Precedure

I think it will help to clarify our thinking and planning if we ask ourselves a few more questions:

Have you ever analyzed your territorial sales possibilities and contacts among dealers, and by towns, for determining available business opportuities so that you know more about your prospects and necessary contacts than any salesman?

Do you know anything about the market in the making?

What ideas and changes are being discussed?

Do you really *know* all your competition? The

*Presented Before the National Sand and Gravel Association at Detroit, January 6th, 1928.

names, locations, and management policies? The true character and real value of their lines, selling and business methods and contracts? Management personnel and representatives? Advertising and promotion work? Sales record? Service?

How do your sales organization and method compare with others? Age of men? Technical education of men? Sales training of men? Length of service? Experience in the field? Salaries? Volume of sales per man? New ideas in sales methods? How much better are they?

What salesman's compensation methods do you use? Are your men satisfied? How have your compensations worked? What is your sales turnover? Do you control your sales effort from headquarters?

Do you make an analysis of your volume by lines of product, demand, customers and salesmen? What does it indicate about increasing and decreasing lines or demand?

Do you analyze sales performance month to month and season by season for each line of product and demand, customers and salesmen and territories?

Do you periodically estimate what each line of demand will require? Each customer?

Do you budget sales expenses against expectation? How does your budget work out?

Have you a list of customers, present and prospective, arranged territorially, by classifications of demand and credit desirability?

Do you require daily reports on all important sales facts, and for all sales calls?

Do you require Lost Order reports? What do you do with them? Do they go to competent people for analyses? Do these people then discuss them with your salesmen for training purposes?

Have you analyzed the Lost Orders for last year? What did the Analysis show as the reasons? Ever check up to find the real reasons?

How do you advertise? Why?

Do you use direct mail advertising? Why? Do you get traceable results? What?

What do you advertise?

Suppose you had a comparison made? Suppose the whole industry had a monthly audit? Wouldn't help? Of course, it would.

"Profitless prosperity."

## What Should It Cost?

The man who does not know his cost is in no position to control his profits in good times or bad. You can't fix prices except in one way—fix them on your costs. No government has yet demanded that you must lose money. Stabilizing costs means stabilizing prices.

It might be a good idea if the law required that no manufacturer should take an order at a price under cost. Such a law would, at least, lead to some interesting results. It would make us get more accurate costs, for one thing; and that would be a great eye-opener to some operators.

I see you have made one step toward standard accounting practice. You made a beginning in the Standard Depreciation Scale. That is excellent—assuming it is scientific.

There has been a big development among associations in the adoption of standard cost practice. In every case it has helped the price situation—and in many cases materially aided the tax situation, and the profit possibilities.

In one industrial group the standard cost work has gone so far that the group can draw up a Profit & Loss statement showing the condition of the industry as a whole. Taking that statement as an attainable standard, it then shows those that are better—as good—and worse.

The Association then shows the badly off what policies and methods are responsible for their bad showing. The standard cost system has had a very valuable effect on the whole industry. Such standardization has a very valuable use in rate hearings, such as you have to prepare for, and handle periodically.

Totally apart from the value to the industry at large the standard cost system shows the individual operator what he can do, and he knows what the other fellow can do (although he does not know under this association system the costs of any other member), because he knows the average costs of the profit makers and the average costs of the failures.

It has been my observation that operators will not take business, in any large proportion of cases, at less than cost, when they know it. It is the fellow who works on guess-costs, or near-costs, who fools himself by thinking—"If Jones can do it, I can."

I recommend further investigation of the value of standard cost systems to you operators. It will give you better control of production operations—financing and sales—therefore, control of profits.

It is well to remember one thing, however, the high-cost producer is always in danger. No association can help him to maintain the high prices that must go with high costs. The association can show him how to find his costs, and show him how to cut them. If he won't, or can't be shown, then at the first squeeze in the market, lessening of demand, prices seek a lower level. He disappears, at once, or later, inevitably. It is the price of Progress.

It is well for you to remember that age and size of a company play relatively little part in the matter of fixing the importance of a concern in an industry. If age has been permitted to ossify the thinking powers, slow up the speed, lessen the progress, then age is a handicap. Size is only important to the buyer if it insures service.

The really important thing is—

Can the company give the buyer what he wants, when he wants it, at a fair price?

Where do you stand on your costs? How do you know? Can you afford, in the market that is developing, to be anything less than absolutely certain?

* * *

### Horse-Trading and Pricing

Scientific buying and selling, in this machine age, is becoming the order of the day. Recently, Albert L. Salt, President of the Graybar Electric Company, said to an interviewer:

"The trader is being eliminated. I can remember when the best horse trader in the village was looked upon as a natural born business man."

There is little place for the David Harums in modern business. They have gone out with single-entry bookkeeping, the horse-car — the pick-and-shovel operator—the horse-drawn vehicle.

The trader in business, as Mr. Salt says, aimed "to buy things for less than they were worth and to sell them for more than they were worth." You all know him.

Jones says, "Now, Bill, you and I have been friends for ten years. I want to give you this order, but you're too high—'way out of sight, in fact. Sharpen your pencil and see if you can't come within reason and I'll give you the order."

Bill gives him a long look. Pulls out a pencil, asks who is on the job—recognizes a couple of price-cutters—sighs—and cuts.

He gets the order on a basis of trading dollars with Jones, and Jones smiles contentedly as he contemplates a nice, fat, extra profit that he had bluffed out of his dear friend Bill.

Bill goes back to the office and tries to figure out how he can "beat the game" by giving his dear friend Jones less than he is paying—all being fair for the seller when the buyer is a liar.

The trader was, and is, a menace to the buyer always—and he can not build a real business on that principle in these days. We are just beginning to realize that he is a menace to the whole business, to everyone of his competitors, individually and collectively, not only because he injures immediate profits but because he lessens the confidence of the public in the industry.

This applies with peculiar force to your industry because its product is being standardized—and so much of your future prosperity is bound up in how you play the game with the public, as well as among yourselves.

The Buyer is waking up.

The National Association of Purchasing Agents has condemned the practice of playing off one bidder against another to get a price advantage.

The Associated General Contractors of America have disapproved the practice of changing the price once the bid is in the Buyer's hands.

Horse-trading tactics don't pay buyer or seller.

Make a price based on your costs—plus a fair profit—and stick to it.

If all of you will do that—and if you will develop the market that belongs to you—you can put "prosper" back in Prosperity.

If you will know your costs—produce what you can sell—and do it in the light of the best experience, and with reasonable skill—you can make Prosperity pay you a profit.

### Finally

Some will see nothing in all this idea of following the facts—despite the evidence that has accumulated that it is the only way. Such men will pass, and the buyers that once knew them will know them no more.

Others will wait and see. Some of these will over-wait and pay the penalty in re-organization and refinancing. Some will never see. "They have eyes and see not." They are always with us. They, too, will weep and wail.

A few see, and will hasten to act. Theirs is the burden of the doing. It is one of the penalties of their leadership.

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## Unusual Specifications for Concrete

In the construction of a factory building at Annerril, France, the following specifications for the concrete were made: The allowable stress on the concrete in the columns or the slabs and frames shall not exceed 0.24 or 0.28, respectively of the crushing strength of the concrete at seven days, on 8 inch cubes made on the job, nor in any case 720 or 920 lbs. per sq. in. respectively. The ratio between the weight of cement and volume of water shall not be less than a given figure. The ratio between the fine and coarse aggregate shall be between 0. and 1.0. The slump shall not exceed 6 inches. The crushing strength of cubes at seven days made on the job shall not be less than 3.5 times the figure taken by the contractor as the safe working stress. The cement used shall be rapid-hardening Portland.

M. G. Magnel (Le Genie Civil and Concrete December 1927).

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## New Cement Machinery

The Loesche Mill, patented in Germany, consists of three main parts, the mill itself, the blast apparatus and the vacuum sifter. The first two are driven by the same electric motor. The grinding device is a rapid running edge mill, consisting of a horizontal disc on which several, usually three rolls, each revolving about its own axis, grind. C. Naske (Zement, December 22, 1927).

# A PREDICTION OF PROSPERITY FOR 1928

By O. W. Hayes,
President, Republic Motor Truck Company, Inc.

THE unusual thing about 1928, is that although it is a presidential election year, everything points to it being a splendid year for business in general, and for the automobile and truck industry especially.

Until recent years, there has always been a feeling of doubt and uncertainty as we approached the presidential election, and this feeling re-acted unfavorably on the business and industry of the country. Today, we find government officials, industrial leaders, and the great body of American business men, predicting a splendid year ahead, and to show they are sincere, these business men are spending real money in preparation to get their share of this year's predicted prosperity.

There is no sound reason for looking at 1928 with any feeling other than one of genuine optimism. On the other hand, there are plenty of good reasons for anticipating one of the best business years in a long time. First of all, there is the feeling of confidence and optimism which is generally prevalent. This means half the battle. Psychology plays a big part in our industrial world, where the various activities are so delicately attuned and react so quickly. All business and industry in the country—and throughout the entire world for that matter—are closely inter-related so that a given situation in one industry has its effect on other related industries. Sales fall off naturally when the general class of buyers is depressed over the present and future outlook. And, inversely, sales increase when a feeling of optimism is abroad. That's the condition existing today. Optimism has the upper hand—and rightly so. America is the greatest country on earth. We possess a large share of the world's wealth. We have greater purchasing power than at any time in our history. Our manufacturing superiority is generally acknowledged. Savings accounts in our banks are higher than ever. Money is plentiful. Interest rates are low.

The farmers, who form one of our most important industries, are in much better shape than they have been for some years, and the purchasing power of the farmer is on its way back to normal. Take the State of Nebraska alone. According to authentic reports, the 1927 farm crop was worth $373,000,000 or fifty per cent more than the 1926 crop. It is the fifth most valuable crop the state has ever had. That means increased buying power for the farmers of Nebraska. Much of that money will be spent in 1928. This same thing is true of the rural districts generally, and a marked improvement is noted throughout the farming regions.

Getting down to the truck industry itself, I look for a splendid year's business. This prediction is based largely on the general era of prosperity which our country will experience this year, and also on the fact that, although competition is keener than ever before, the truck manufacturers are building better trucks, and are conducting their sales programs along more effective lines.

The constant growth and expansion of our good roads is widening the truck market. Trucks are faster and more efficient to take advantage of the national network of good roads, so that truck transportation costs are considerably reduced, and at the same time distribution and trading areas have been greatly increased by this higher standard of motor truck performance. In other words, the motor truck, as an economic unit in our national transportation system is coming to the front rapidly as a vital and desirable factor.

There is greater stability in truck selling than ever before, simply because the manufacturers and sales directors are following sound selling policies.

Reports from Europe, South America, Mexico, and Australasia are strongly indicative of business prosperity in those countries in 1928. The volume of automotive export business has experienced a steady growth and this year bids fair to out-do all previous records.

## Purifying Silicates

Clay and other materials containing iron ore are bleached or decolorized by treatment with acid, with or without a reducing agent, and with aqueous solutions of soluble salts, the bases of which do not form colored compounds with non-chromophoric acid recticles, which are not reducing agents, and of which the acid radicles do not form insoluble iron compounds. Salts of polyvalent metals such as aluminium, calcium, barium or magnesiu, or ammonium salts may be employed, as, for example, the use of aluminum sulphate or the alums. The salt may be added to the bleaching acid, or to the water used for washing and treated clay or to both; or be mixed with the clay suspension before the latter is treated; or be formed in situ by the addition of basic compounds of the metal to the acid.

## Unsintered Hydraulic Cement

A mixture of lime and clay is calcined with an oil shale fuel. The product is then ground to cement. Various additions may be added to the product at any stage of the process such as burnt shale, limestone or marl. Rekord-Zement-Ind., and O. Teteres

# INTIMATE NEWS OF MEN AND PLANTS

## Pacific Cement Company Buys Two Ships

The Pacific Coast Cement Company has recently placed in operation the Japanese built steamships, Eastern Leader and Eastern Guide, purchased from the Shipping Board. The vessels will sail between Seattle, Washington and Dahl Island and be operated by the Pacific Coast Steamship Company.

## T. A. Gotschalk Buys

Properties of the Merne Artificial Stone Company, Merne, Indiana, were recently acquired by T. A. Gotschalk. The building will contain the offices of the operating company and the B. and G. Construction Company. The Gotschalk Supply Company which is being formed will deal in sand, gravel, building materials and coal. A series of silos will be constructed in which to store the materials and serve as an exhibit for the Construction Company.

## Discusses Romance of Rock

"The Romance of Rock" was the subject of an interesting address recently delivered before the Niles, California, Chamber of Commerce by M. McHugh of the Pacific Rock Company. The company has purchased considerable land near Centerville and proposes to install washing equipment and build a road to connect with the Centerville-Newark highway.

## New Plant for Montana

A new plant is to be erected and operated by the Pioneer Sand and Gravel Company at Horton, Montana, for the purpose of supplying washed gravel to the Northern Pacific Railroad. This is the sixth plant to be put in operation for serving the Northern Pacific and will supply 600,000 cubic yards annually.

The Northern Pacific now has 730 miles of washed ballast road bed. In 1928, 186 miles, making 926 miles or nearly half the distance between the Twin Cities and the Coast, will have a road bed which adds to the riding qualities and is almost dustless. General Manager stated recently that the Northern Pacific is expending $3,000,000 in ballasting its tracks with washed gravel in addition to the $2,000,000 being expended for heavy steel.

## Colorado Portland Cement Increases Production

The new cement plant of the Colorado Portland Cement Company at Boettcher, Colo., is now producing 3500 barrels of cement per day. The plant has a storage capacity for 800,000 sacks of cement which it will have filled and ready for the spring demand. It has recently changed its fuel from coal and gas to an exclusively gas fired plant.

## Vermont Marble Employees Adopt Insurance Program

Approximately 2,500 employes of the Vermont Marble Compnay, are subscribing to a plan of health and non-occupational accident insurance, which was recently installed for them by their employer, through contract with the Metropolitan Life Insurance Company. The program is being underwritten on a cooperative basis, whereby the employer makes substantial contributions towards premium payments.

According to the salary of an employee, the sick and accident benefits range from $10 to $20 a week. These payments will continue for a maximum of twenty-six consecutive weeks, when an employee is unable to work due to sickness from any cause, or when such incapacitation is due to a non-occupational injury.

The Vermont Marble Company has branches throughout Vermont, as well as in Dallas, Houston and San Antonio, Texas, Cleveland, Chicago, New York, Philadelphia, Boston, San Francisco, Los Angeles, Tacoma, Washington, Peterboro, Ontario. Sub-offices are located at Albany, N. Y., Washington, D. C., Charlotte, N. C., and Detroit, Mich. Where the size of the population warrants the insurance company maintains a visiting nurse service for the benefit of employes insured under the plan.

## Universal Gypsum and Lime Purchases Higginson

Universal Gypsum and Lime Company announces the acquisition of the properties of the Higginson Manufacturing Company, consisting of the gypsum plant at Newburgh, N. Y., two hundred seventy acres of land at Windsor, Nova Scotia, containing millions of tons of gypsum rock, and an interest in the lime plant at Ossining, N. Y.

In 1877 Colonel Henry Higginson acquired the business of the Newburgh Cement Plaster Company, and under his guidance the Higginson Company has manufactured the highest grades of gauging, moulding and dental plasters. Colonel Higginson was the pioneer in importing Nova Scotia gypsum rock for the purpose of manufacturing plasters of high quality in the United States.

The mill at Newburgh, N. Y., is located on the Hudson River, where its one thousand feet of water front offers excellent facilities for water delivery to the metropolitan district of New York and to steamship piers for export shipments. The property is situated directly between the river and the West Shore Railroad.

In securing the Higginson properties, the Universal Company has rounded out a complete line of gypsum products. It now manufactures every gypsum product used in the building industry, including gypsum wallboard, gypsum block, Insulex, finishing, moulding and cement plaster.

With sales offices located in the larger cities east of the Rocky Mountains, and with manufacturing plants in New York State, Iowa, Texas, Pennsylvania and Virginia, the Universal Gypsum & Lime Co. can give excellent service and meet all the requirements of the trade.

## Escandido Cement Products Hold Annual Meeting

Stockholders and officers of the Escandido Cement Products Company of Escandido, Cal., held their annual meeting January 9th. The reports indicated a satisfactory year of 1927 and a much better outlook for 1928. The directors for the ensuing year are J. B. Dixon, W. W. Prior, J. J. Rutherford, B. C. Wolhlford and P. S. Barker.

## New Asphalt Producer for Oklahoma

The Contractors Asphalt Company of Florence, Alabama, has recently been incorporated for the purpose of developing asphalt mines and has acquired a number of properties. Tyler Calhoun is president, W. C. Beck, vice president and John Walls is secretary-treasurer.

## California Portland Plans Many Improvements

The California Portland Cement Company has a well defined plan to replace its kilns with larger and more modern types at the Colton, California plant. There will be considerable changes made in the storage facilities.

## Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering.

1,653,111. Mining mechanism. Fred T. Lobbey, St. Louis, Mo., asignor to Sullivan Machinery Co., Claremont, N. H.

1,653,247. Shovel or crane. Charles B. Zollinger, Sterling, Ohio.

1,653,333. Fine-grading machine for highway construction. Robert D. Baker, Birmingham, Mich.

1,653,395. Pavement. James F. Driscoll, Buffalo, N. Y.

1,653,620. Door for excavating-dippers and the like. John O'F. Clark, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.

1,653,631. Closure for pneumatic concrete conveyors. Harry B. Kirkland, Chicago, Ill., assignor to Concrete Mixing & Conveying Co., same place.

1,653,739. Power shovel William W. Sloane, Chicago, Ill., asignor to Goodman Mfg. Co., same place.

1,653,826. Mining apparatus. Leon E. Simmons, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,653,906. Self-clearing dredging and excavating bucket. Charles Harrison, Vancouver, British Columbia.

1,654,168. Concrete-mixer. John P. Gilson, Port Washington, Wis., assignor to Kwik-Mix Concrete Co., same place.

1,654,218. Mining apparatus. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,654,590. Conveyer and sifting-screen apparatus. Frithjof N. Kolberg, Spencer, S. Dak.

1.654,638. Crushing and separating apparatus. Paul L. Crowe, Baltimore, Md.

1,654,639. Crushing apparatus. Paul L. Crowe, Baltimore, Md.

1,654,746. Pavement and method of manufacturing it. Charles A. Mullen, Montreal, Canada.

1,654,770. Method of and apparatus for automatically splitting or cleaving slate blocks. Hugh G. Williams, Granville, N. Y.

## New Incorporations

Florida Sand Corp., care of M. E. James, Bartow, Fla. $500,000. S. D. Gooch, B. C. Wilson.

Chillicothe Sand & Gravel Co., Chillicothe, Ohio. 500 shares n.p.v.; $50,000 pfd. George W. Quilin, E. H. Davis, E. M. Marquand.

Carbon Shale Products Co., Soythal, Tenn. $5,000. Benton McMillin, H. E. Rodes, J. B. Briggs, J. F. Eggleston, W. A. Johnson.

Diamond Marble Co., Wilmington, Del. $5,000.

Otis Construction Co., 42 E. Pearson St., Chicago, Ill. $50,000. Quarry stone, dig earth, sand, gravel, clay. T. J. Murray, M. A. Flanagan, W. P. Cagney. Correspondent, T. J. O'Grady, House of Representatives, Springfield, Ill.

Union Processes, care of A. T. Cole, 30 E. Forty-second St., New York City. Quarries. 20,000 n.p.v.

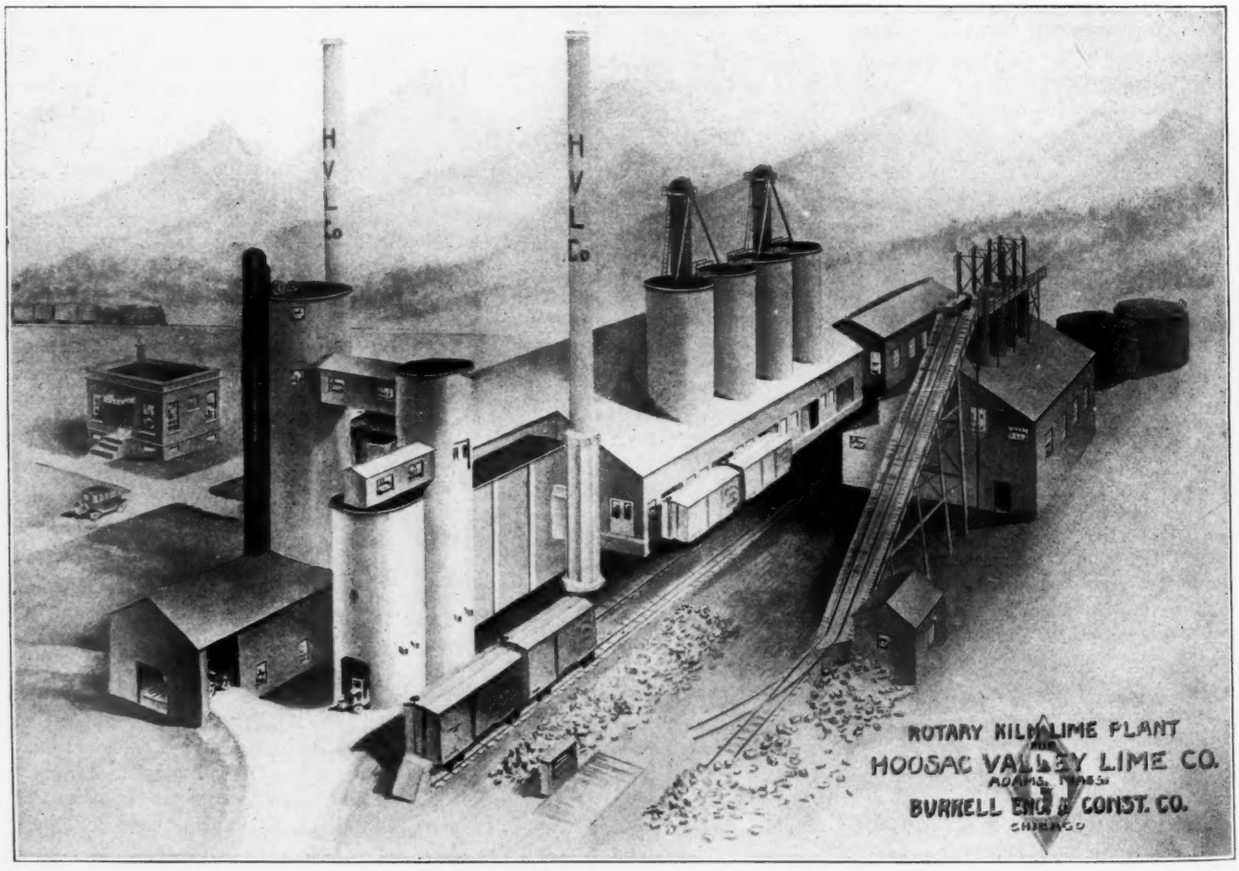
Utah Rock Asphalt Corp., Sunnyside, Utah. $1,500,000. C. N. Power, Pres.; John F. Cregan, V.P.; Ben Bergerman, Sec.; Herbert A. Black, Treas.

Contractors Rock Asphalt Co., Florence, Ala. $275,000. To develop asphalt mines. Tyler Calhoun, Pres., Florence; W. C. Beck, V.-P., Sheffield; John Wills, Sec.-Treas., 913 S. Fortieth St., Birmingham.

Pioneer Gravel Co., Helena, Mont. $50,000; 500 shares, $100 each. T. B. Weir, Harry P. Bennett, John J. Mitchke.

## Brownell Moves Office

Brownell Improvement Company announces the removal of its offices to rooms 624-632 Builders' Building, 228 North La Salle Street, Chicago.




Artist's Drawing of New Plant of the Hoosac Valley Lime Company.

# NEWS OF EQUIPMENT MANUFACTURERS

## Cross Equalizing Device Perfected by Whitcomb

The Geo. D. Whitcomb Company has perfected a cross equalizing device that gives an additional advantage to Whitcomb gasoline locomotives.

The device consists of a crossbar centrally pivoted on the front of the frame so that any excess load on either front spring is compensated for by the oppositely operating action of the crossbar. The action is just as the name indicates; i. e., an equalizing action that distributes the load equally to both front springs, and thus maintains the rail-load in constant balance.

Such a device has peculiar value as applied to gasoline locomotives, because in many cases the locomotive is operated over temporary, rough tracks. This equalizing device increases the flexibility of the locomotive, since it tends to keep the weight of the locomotive in constant balance, so it can ride very rough track not only safely, but much more smoothly.

With this device, Geo. D. Whitcomb gasoline locomotives have an absolute three-point suspension.

## Repairing Crusher Quickly

While a machine is idle, due to breakage there is a loss of production so that plant owners are turning to oxy-acetylene welding to make sure of keeping production from being stopped over long periods due to breakdowns.

The advisability was recently demonstrated when the eccentric of a 42-inch gyratory crusher developed a crack 54 inches long and 3 inches deep. It was in the form of an L, extending to the small end. After the edges were properly beveled, the work was performed as in bronze welding practice and 70 pounds of bronze welding rod was used. The machine was placed in operation, the only difference being in expense and delay which were eliminated by oxwelding.

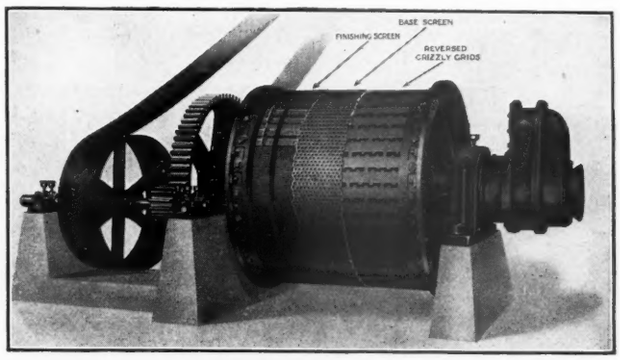
## Rollins Joins Whitcomb

The Geo. D. Whitcomb Company announces the appointment of Mr. Ralph Rollins as its sales representative in North Carolina, South Carolina, and southern Virginia.

Mr. Rollins was formerly with the Easton Car and Construction Company. He takes up his new duties at once and has established headquarters at 1206 Commercial Building, Charlotte, North Carolina.

## A Screening Ball Mill

Bulletin 424 of The Braun Corporation is an illustrated description of the Herman screening ball mill taken from actual operation, with tables and data of unusual interest. It has apparently perfected one pass ball mill grinding, which screens as it grinds and has a peripheral discharge, caused by reversed grizzly grids. As the illustration shows it is cylindrical in shape and is driven by a spur gear and pinion. Standard sizes range from two feet by 15 inches to 6 by 6 feet. The material enters the cylindrical shell at one or both ends by a variety of feeding methods.




Screening Ball Mill.

Referring to the illustration, it is observed that the shell is composed of three parts: reversed grizzly grids of manganese steel; the grids are surrounded by a base screen of carefully rolled punched boiler plate in two sections; over the base screen is fitted the fine or finishing screen, with mesh the desired size. It is noticeable that every nut and bolt is easily accessible from the outside.

The construction is rugged yet simple, which is easily observed by the manner in which the heads are joined to the shell to withstand the stress caused by the cascading of the balls. Between the grids and a circular lug on the head piece, wedge blocks act to take up the strain and prevent loosening or stretching the bolts.

End pull take ups are adjusted to the finishing screen which gives a smooth fit on the base screen. The mill is kept leak proof by felt gaskets under the end bands which confines the discharge solely to the screen openings.

The reversed grizzly grid makes peripheral discharge practical which, together with the extensive force of the cascade, accelerate the discharge and increase the output. The material must be reduced to the ruling size before it can be discharged which permits of no oversize and eliminates the necessity for separate classifying machines. As the material is free to escape when reduced to the ruling size there is a minimum of unnecessary grinding and a consequent reduction of fines.

The power serves only two purposes, grinding the material and extruding it through the screen and is spent on oversize and not on that which is sufficiently fine. Because this is a combination grinding and screening machine no power is consumed to operate a classifier where not less than 80 mesh is desired, as the material is ground, screened and discharged in one operation.

## Calhoun Joins Foote

Mr. S. W. Calhoun has recently joined the sales organization of Foote Bros. Gear and Machine Company and has been appointed Southeastern District Representative with headquarters at Asheville, N. C. From this point he will control the States of Tennessee, Kentucky, Virginia, North and South Carolina, West Virginia except the northern section handled from the Pittsburgh office.

Mr. Calhoun is an engineer of ability and reputation, and there is no question but what his location at Asheville is going to be of considerable benefit to customers of the company in that section.

## New Chicago Warehouse

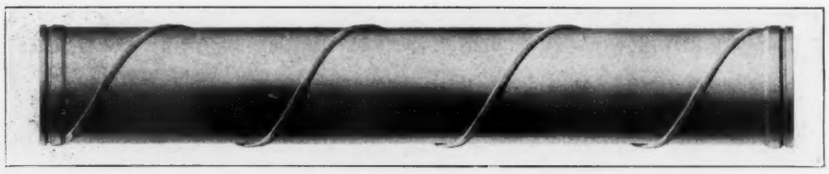
Of interest to all wire rope users located in the Chicago district is the announcement of the American Cable Company that a large storage warehouse has been established in Chicago. This will permit carrying complete stocks of all sizes of TruLay wire rope and TruLoc fittings and result in practically immediate service.

## Naylor Pipe Now Made of Toncan Iron

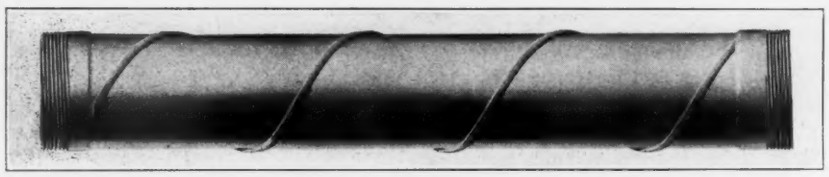
A new pipe combining the advantages of the greatest conveyance pipe development of modern times—Naylor spiral lock-seam pipe—with Toncan Iron, which the manufacturer believes to be the greatest improvement in two decades in the manufacture of commercial iron—has resulted in Naylor spiralweld iron pipe, made of Toncan Iron.

Through the combination of these two outstanding products, industry is offered the twofold advantages accruing to Naylor Pipe and to Toncan Iron, which have never been obtainable in a standard product prior to this time.

Naylor spiralweld iron pipe is the only Toncan Iron Pipe made to wrought pipe standards, size 4 to 12 inches, 20 foot lengths, threaded ends for standard screw fittings, and flanged ends for standard flange fittings, black, galvanized or asphalt dipped.



Grooved End for Use With Victualic Couplins and Fittings.



Threaded Ends for Use With Vitualic Couplins and Fittings.

Heretofore Naylor Spiral Pipe was sold or recommended only for low and medium pressures. It was only natural that due to the unheard of and unusual design of this pipe, it would not long be limited to such a thin market as low pressure, light weight pipe dictated. Industry, therefore, demanded the pipe for more general and broader uses.

It was necessary at once to make it over into a high pressure pipe. The spiral seam was therefore welded to the wall of the pipe. This additional strength, due to the tightly locked and rolled four ply seam, is not necessary in most instances, but serves as a double safeguard for high pressures. The welded seam makes Naylor spiral truly a pressure conveyance medium, equal in strength to wrought iron pipe, yet one half as heavy.

Naylor spiral lock-seam pipe has long served many industrials for conveyance lines—sand and gravel, paper and pulp, mining and process—because it has an absolutely smooth inside and true diameter, which provide a minimum of frictional resistance, and reduces to a minimum capillary attraction and clogging. It has the added advantage of light weight for ease and economy of shipping, handling and installing.

## Bins and Hoppers Discussed

The Butler Bin Company is distributing several illustrated bulletins, in a binder, devoted to a discussion of bins for almost any purpose. The business was created by first building a steel bin for use while the Butler Company was engaged in the contracting business. The demand for steel bins has become so increasingly insistent that the business has grown sufficiently to see the company housed in its own quarters and its efforts exclusively directed to research and manufacturing.

Bulletin10 contains a discussion on steel versus wood bins and shows the immediate and ultimate savings by using steel instead of wooden bins and includes photographs showing both steel and wood bins, taken from actual installations.

Bulletin 100 is devoted to the type "V" two compartment bins made in five different styles. It includes photographs of the bins in use and line drawings and specifications of the bins.

Bulletin 101 is concerned with typical set ups for material handling with Butler bins. These set ups are drawings showing a few of the many possible arrangements to which may be added considerable more recent data of interest to operators.

Bulletin 110 contains descriptions, drawings and photographs of the type "S" single compartment bins which should meet the need for strong, self-cleaning single compartment bins for crushing plants, material yards and contractors.

Bulletin 130 is devoted to types "A", "D" and "C" measuring hoppers for accurately proportioning aggregates by a positive method that will eliminate variation in the cubic measurements. These hoppers meet the demands of specifications and are satisfactory to contractors and engineers.

"Butler Bins and Hoppers for Sand and Gravel Plants" is the title of the twelve page illustrated bulletin 160. This bulletin discusses the application of these particular bins to the industry and gives diagrams, photographs and specifications of operating plants and the advantages gained.

Bulletin 120 describes the type "R" two compartment folding bins, especially designed for use in city street work and construction jobs where easily portable bins are required.

Bulletin 140 shows the Butler Bin gates in operation and states that they cannot be broken by an ordinary action common to the average plant, as they may be hammered or pried in the coldest weather and undergo extremely rough treatment.

Weighing hoppers are discussed in bulletin 15 which are designed especially for the "weigh as you load" sand and gravel yards and to accurately weigh the aggregates.

"Unit Bins" is the title of an illustrated supplementary leaflet. The Butler unit bins were developed for materials yards and gravel washing and screening plants.

## Small Revolving Shovels Described by Bucyrus

Bulletin E-1003, Bucyrus electric small revolving shovels, clamshells, draglines and cranes, is being distributed. These machines are built as shovels with dippers ¾ to 2 yards capacity and as dragline excavators with buckets from ¾ to 1½ yards capacity. All sizes may be equipped with a.c. or d.c. motors as conditions demand, while the larger of these small shovels is equipped with Ward-Leonard field control.

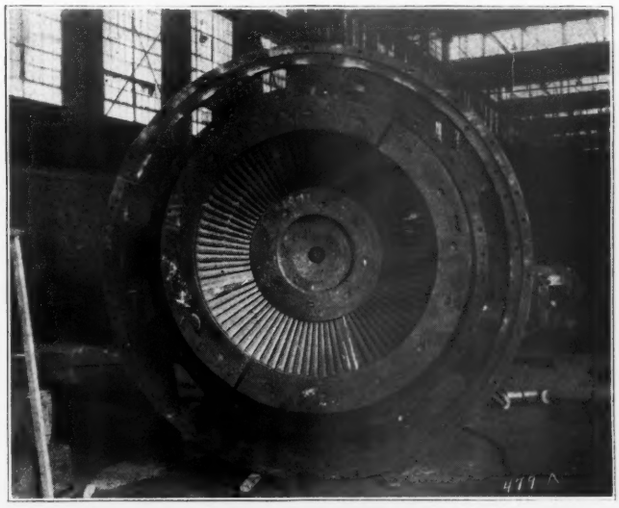
Some of the advantages claimed for these shovels are, the patented rope thrust which permits quicker dipper action, more vigorous shaking of the dipper, permits a simple thrusting mechanism and makes possible a thrust of greater power; boom is of the all steel box-girder type with dipper handles passing on the outside; the caterpillar traction has few parts making it strong and serviceable; the greatest possible degree of accessibility to both electrical and mechanical parts; a long straight lead for dragline cable so that the rope cannot pile on drum and cause delay or excessive wear; and the swing machinery is in front where the principal swing load is applied.

## Traylor Developments in 1927

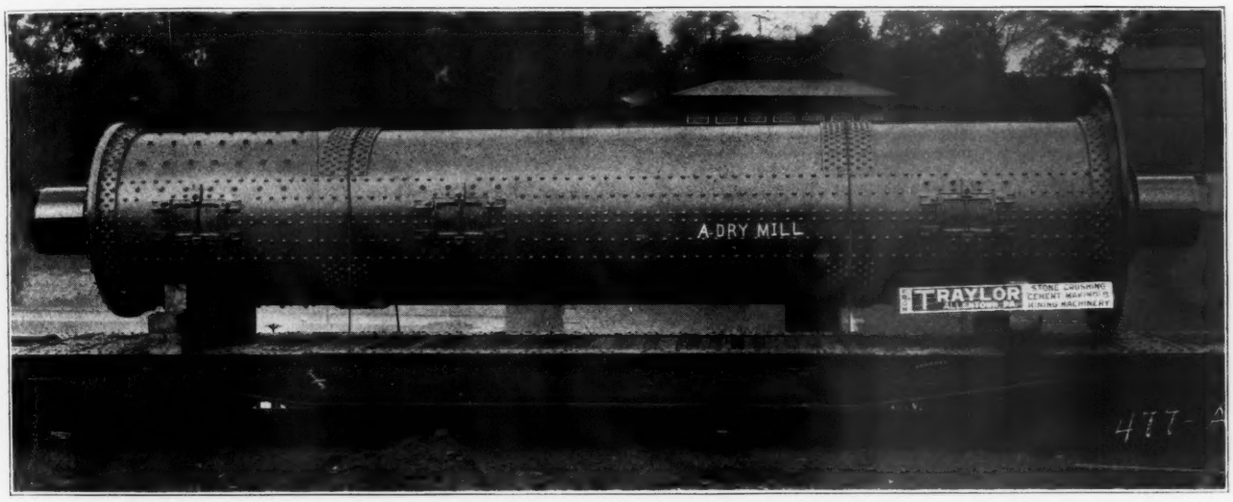
The business of the Traylor Engineering and Manufacturing Company with the cement manufacturers of the world, has been of very considerable volume during 1927 and has shown a continued trend toward larger burning and grinding units.

### Compartment Mills

During the past twelve months orders have been executed for a large number of very long Traylor compartment mills, in diameters of 7 and 8 feet, and in lengths up to 47 feet, for service in both the raw grinding and finishing departments. These long mills have been ordered for new plants as initial equipment, as well as by old companies for replacing existing units or for increase of capacity.



Diaphragm For 7 by 45 Foot Mill




A 7 by 40 Foot Mill for Northwestern Portland Cement Company

For example, among many others, may be mentioned a 7 foot diameter by 45 foot compartment mill for San Antonio Portland Cement Company, Cementville, Texas; two 7 foot diameter by 40 foot compartment mills for Northwestern Portland Cement Company, Grotto, Wash.; four 8 foot diameter by 26 foot compartment mills for Pacific Portland Cement Company, Redwood City, Cal.; four 8 foot diameter to 7 foot diameter by 47 foot compartment mills for Marquette Cement Manufacturing Company, Marquette, Mo., and one each 7 fot diameter by 26 foot, and 8 foot diameter by 26 foot compartment mills for Peerless Portland Cement Company, Detroit, Michigan.

The Peerless plant at Detroit, it may be mentioned here, is completely Traylor-equipped and now operates four 7 foot diameter by 26 foot Traylor compartment mills on the raw end, four 8 foot diameter by 26 foot Traylor compartment mills on clinker, and burns its clinker with three 11 foot diameter by 175 foot Traylor two-support rotary kilns.

The design of, and the methods used in the manufacture of Traylor compartment mills are both particularly adaptable to the construction of long mills of large diameter which shall run true within an infinitesimal fraction of an inch. For instance, after the head flanges are assembled with the shell, the unit is swung in a lathe, specially built for the purpose, and the flanges turned absolutely true and parallel. This lathe will take any diameter mill of any length which may be demanded.

This one detail of manufacture is one of the many features (and perhaps the most important), of Traylor compartment mills.

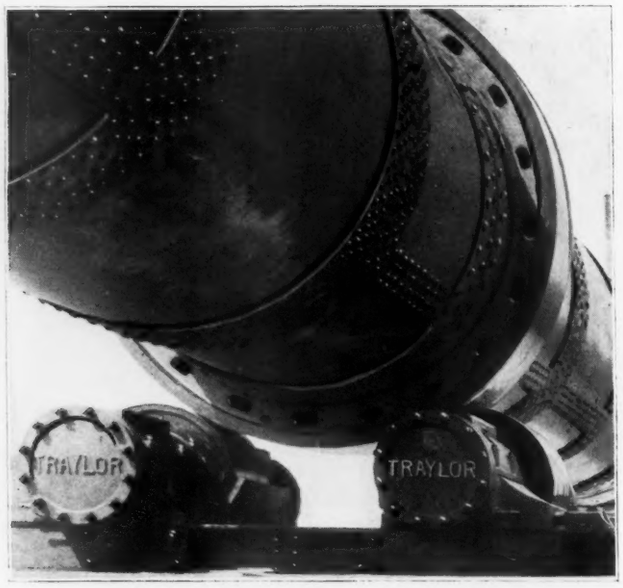
During 1927, details of construction have been refined all over the machine, but there have been no radical changes in design of the Traylor compartment mill. Special attention has been given to the design of the partition and discharge diaphragms, which has been simplified and therefore much improved from the standpoint of assembly in the machine.

Traylor compartment mills are completely assembled and mounted, in the shop, before shipment, and when facilities at destination permit so handling, the mill shell, with heads and trunnions and all linings and diaphragms in place, is shipped as a unit. Otherwise, heads and trunnions are shipped separately, and sometimes, of course, limited facilities for final erection require still further dismantling.

### Rotary Kilns

Traylor rotary cement kilns have, for many years, in every way satisfactorily met the demands of cement manufacturers for large output and economical operation and maintenance.

The reason lies in the fact that all parts, while of the simplest possible design, are of generous strength, and the utmost accuracy is employed in the machining and assembly, particular care being exercised with reference to the butting joints of the kiln sections so that absolutely correct alignment of the shell as a unit may be secured.




Illustrating the Traylor Roller Support

The single detail contributing to these results in the greatest measure is an outstanding feature of Traylor rotary kilns—the single roller support, which permits lining up the kiln with the greatest accuracy, before the shell is placed in position.

As a result of the niceties of design and care used in the manufacture of Traylor rotary kilns, erection is accomplished in the least possible time and at minimum expense, and operation costs are held down by reason of true and easy running of the kiln at small power consumption.

Keeping pace with compartment mills, the Traylor kilns sold in 1927 have been of very large size, having been mostly eleven feet, three inches in diameter and up to three hundred and forty-one feet long. A unit of this size was recently sold, and when placed in operation will complete a quintet of the largest kilns in the world, all Traylor-built, as follows:

Phoenix Portland Cement Corporation, Phoenixville, Ala., two 11 feet 3 inches diameter to 10 feet diameter, 343 feet 9 inches long.

Trinity Portland Cement Company, Houston, Texas, one 11 feet 3 inches diameter, 300 feet long.

Missouri Portland Cement Company, Prospect Hill, Mo., one 11 feet 3 inches diameter to 10 feet diameter, 311 feet long.

Monolith Portland Cement Company, New Wyoming plant, one 11 feet 3 inches diameter to 10 feet diameter, 341 feet long.

Almost a third of a mile of modern rotary kilns with a combined capacity of over ten thousand barrels per day!

A notable kiln installation during the year was of two 8 feet by 150 feet kilns and two 6 feet by 50 feet coolers for the Hoosac Valley Lime Company, Zylonite, Mass., being part of a new lime plant designed and completely equipped by Traylor.

### Stone Crushing

Among the producers of commercial crushed stone, Traylor equipment has continued to find favor during the year just closing, a great number of individual crushing and sizing units, as well as complete plants, having been sold.

In 1926, the Pickands Mather Company, a Bethlehem Steel Corporation subsidiary, purchased a 48 inch Traylor Bulldog Gyratory Crusher, and two 20 inch Traylor Bulldog Finishing Gyratory Crushers for the Palmer, Michigan plant, which machines have proven so entirely satisfactory that a few months since, another subsidiary, the Bethlehem Mines Corporation, placed its order for a 48 inch Bulldog Gyratory for its Naginey (Penna.) quarry.

Also during the year the world's largest limestone producer placed in operation its second 60 inch Traylor Bulldog gyratory crusher, increasing the plant capacity to 1,500,000 tons monthly. In this plant is also installed a set of 36 inch diameter by 60 inch Traylor slugging rolls for secondary service, having a capacity of 20,000 tons daily.

The New York Trap Rock Company, the largest eastern producer of trap rock, has this year added a 20 inch Traylor Bulldog finishing gyratory crusher to its Verplank, New York plant, for the production of small sizes.

Incidentally, it may be mentioned that the 20 inch Traylor Bulldog finishing crusher is the largest reduction crusher today available, a machine that has a truly enormous capacity.

In this connection it may also be noted that within the last few months there has been added to the Traylor finishing crusher line, size 15 inch. With this new addition the Traylor Bulldog finishing gyratory crusher line presents the widest possible choice in reduction machines, comprising as it does, five sizes, 4½, 6, 10, 15, and 20 inch.

### Sand and Gravel

The sand and gravel industry has shown increasing appreciation of the value of the Traylor Bulldog finishing gyratory crusher, as is evidenced by the large number of these reduction units which have been sold to that industry during the year 1927.

The Bulldog finishing gyratory crusher is used in a total of about a score of the country's principal sand and gravel plants and has been found to be particularly valuable in the reduction of boulders to marketable sizes, reducing average production cost by the utilization of material formerly considered waste.

The Traylor scrubber is also found very efficient where the product contains clay, having been adopted by such prominent companies as the Bethlehem Steel Company and Charles Warner Company.

The Traylor scrubber is built of standard tube mill design of extra heavy proportions and generous baffles of special type and unique arrangement, which users declare greatly increases capacity.

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## Forsythe Adds Compressors

Forsythe Bros. of 30 Church Street, New York City, have been appointed distributors for Metropolitan New York for Worthington Metalweld portable air compressors. Forsythe Bros. also represent the Moore speed crane. Four brothers constitute the company, Charles E. Forsythe, James A. Forsythe, Richard H. Forsythe and Vernon A. Forsythe. They operate a large warehouse equipped to give prompt and efficient service.

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## Climax Appoints

The Climax Engineering Company, of Clinton, Iowa, announces the appointment of the Equitable Equipment Company, 410 Camp Street, New Orleans, Louisiana, as a Climax Sales and Service representative for the territory of lower Louisiana and Mississippi.

The Equitable Equipment Company will maintain a stock of standard engine units and a complete assortment of repair parts for all models of Climax Trustworthy Engines.

## Data on Heavy Duty Shovels Issued By Osgood

The Osgood Company is distributing bulletin 2707, which gives a historical sketch of the founding and building of the organization with illustrations of the earlier types of shovels. It features the 1 yard and 1¼ yard heavy duty gas or electric shovels which may be converted into a crane, clamshell, dragline or backhoe. It contains photographs of these machines in operation in different parts of the country, drawings of the parts and considerable data.

As a shovel, it is equipped with a combination oak and steel boom. The dipper is hoisted on a two-part line and there is a pull on all parts of the line. The rope is so reeved that it is brought down to a drum, keyed to the hammered steel shipper shaft. With the crowding mechanism it is possible to get an action equal to the bail pull and the dipper can be pushed out as far as it will go at the maximum height and held in the digging bank.

As a crane or clamshell, the boom is of the lattice bow type and gives maximum strength for its weight. The tagline is of an improved type which operates on a track within the boom section and, being a part of the boom, is not difficult to install or remove. It is easily equipped with a pile driver or a lifting magnet. The ready convertibility from a crane to a shovel is very simple as there are no chains to connect, no gears to add and no sprockets to take from or add to the drum. The crane boom and wire ropes are disconnected, the machine backs away and drives up to the shovel boom and handle, the connections are made and it is ready to go.

The back hoe attachments, like crane, clamshell or dragline, are added to the front of the machine with no changes in the operating machinery. The heavy I-beam boom is fitted with alloy steel foot castings and pinned to the outer pair of lugs on the main upper frame casting. The bucket is used in various widths from 24 to 42 inches and may be dumped from the front or through a hinged bottom.

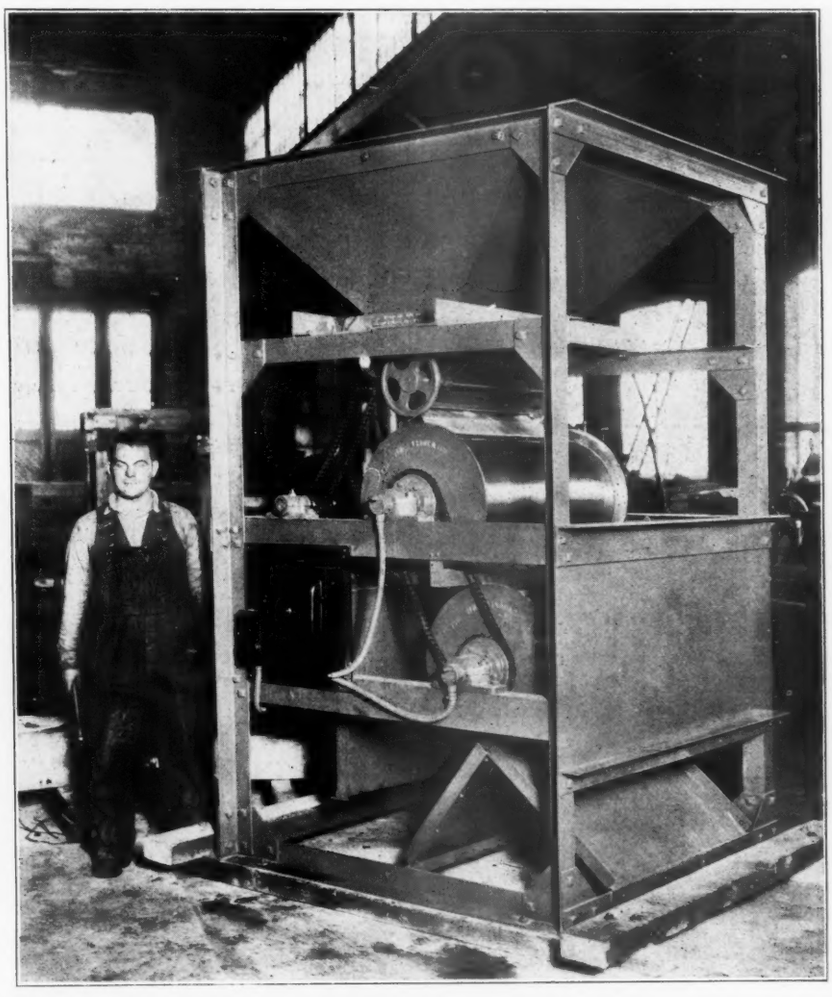
The engines are built especially for heavy duty work and are fitted with the latest accessories with a push button starter. A gas filter keeps the engine clean, a carburetor keeps the engine in perfect running order, an air cleaner is installed to protect the carburetor, and many other accessories are found that make it a pleasure to operate. The power is transmitted from the engine or motor by a heavy silent chain, which relieves the engine of sudden shocks and has a mechanical efficiency of 98 per cent.

## New Type Magnetic Separator Built for Superior Cement

A variable iron content in pulverized slag used in the manufacture of cement was the problem confronting the Superior Portland Cement Company. This variable iron content interfered seriously with their finished product. In order to control this variable so that a high grade finished product could be produced, it became necessary to seek some means for handling and separating the iron content at the rate of forty tons per hour. A series of tests were made by the Magnetic Manufacturing Company, and a "High Duty" Magnetic Separator as illustrated recommended. The installation was made with a minimum expense, as the changes necessary were of minor importance. The material is delivered to the separator by means of a drag flight conveyor. The feed is controlled by an adjustable positive feed hopper. Two independent stationary magnets arranged in staggard relation are mounted in a fixed position within the frame. Pressed steel cylinders of uniform size are mounted on substantial flange end members. These cylinders are made to revolve on ball bearings and are driven by hardened steel roller chain over machine cut steel sprockets. The magnets are designed to produce a maximum magnetic field at the working face of the cylinder, and further, to provide for automatic discharge of the iron removed.

The separator is driven by fully enclosed dc motor. Direct current is also used to energize each magnet. Lead wires are protected by armored steel conduit. The frame is of substantial steel construction, firmly bolted and braced. A fully enclosed safety switch having ample resistance mounted therein to fully protect the magnet windings against breakdown together with motor control is attached to switch panel mounted on frame.

A dust collector system has been installed and the magnetic separator has been fully enclosed. As a result of this "High Duty" magnetic separator installation a high grade product is now produced and in that the iron content removed from the pulverized slag amounts to a considerable item, this iron content is disposed of profitably. It is said that the amount of iron removed will very shortly pay all costs of the separator installation.



New Magnetic Separator.

**Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.**

| RATES PER INSERTION | 1 Inch | 2 Inches | 3 Inches | 4 Inches | 5 Inches | 6 Inches | 8 Inches | 9 Inches | 10 Inches | 12 Inches | 15 Inches | 20 Inches | 30 Inches |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Insertion | $3.75 | $7.25 | $10.75 | $14.25 | $17.75 | $21.25 | $28.25 | $31.75 | $35.25 | $42.25 | $56.25 | $70.25 | $105.00 |
| 2 Insertions | 3.75 | 7.25 | 10.70 | 14.20 | 17.65 | 21.15 | 28.15 | 31.65 | 35.15 | 42.15 | 56.15 | 70.00 | 104.00 |
| 3 Insertions | 3.75 | 7.20 | 10.65 | 14.15 | 17.55 | 21.05 | 28.05 | 31.55 | 35.10 | 42.05 | 56.05 | 69.75 | 103.00 |
| 4 Insertions | 3.70 | 7.15 | 10.60 | 14.10 | 17.45 | 20.95 | 27.95 | 31.45 | 35.00 | 41.95 | 55.90 | 68.75 | 102.00 |
| 8 Insertions | 3.65 | 7.05 | 10.50 | 14.00 | 17.25 | 20.75 | 27.75 | 31.25 | 34.80 | 41.75 | 55.70 | 67.50 | 98.00 |
| 13 Insertions | 3.60 | 6.95 | 10.40 | 13.90 | 17.05 | 20.55 | 27.55 | 31.05 | 34.60 | 41.55 | 55.55 | 66.25 | 94.00 |
| 26 Insertions | 3.50 | 6.75 | 10.20 | 13.70 | 16.65 | 20.05 | 27.05 | 30.65 | 34.20 | 41.05 | 55.05 | 64.00 | 88.00 |

INFORMATION—*"Broadcast"* space is sold by the advertising "inch." Each page contains 30 inches. The width of the page is divided into 3 columns, each 2¼ inches wide. Each column contains 10 inches measured the length of the column. Any space may be used measured by the *even* inch in height (not fractions), by 1, 2 or 3 columns in width. The size of a space is its height in inches multiplied by the number of columns in width. Example: a space 2 inches high by 2 columns wide is 6 inches. Copy changes made without additional charge.

## It Pays to Advertise in PIT and QUARRY

The Central Equipment Co., Detroit, Mich., inserted an advertisement in the two November issues. Regarding the results they write: *"We must have received 40 inquiries from the two ads run in your paper. Just made a sale and expect to close up another, so we got the desired results to start with anyway."*

**Complete Service Publishing Company**

**538 South Clark Street** **CHICAGO**

## LOCATED CHICAGO

**P-H206 Serial 2427**
**Boom 40 ft. Enclosed House, Like New, About 90 Days Service**

# NORTHWESTS

**Combination Shovel—Crane Dragline**

Booms any length; Buckets ¾ and 1 cubic yard. Have cast steel base; feather touch control; high gantries; Delco lighting plants. Like new Serial No. 1114-398-717-830.

Northwestern Belt Conveyor, 60 ft., Used 10 Days, Half First Cost.

Model 21 Ditcher, Parson had 10 Days Service, Half Price of First Cost.

# LOCOMOTIVE CRANES

1—No. 8 BROWNING. 8-wheel MCB. 50-ft. boom.

## NOTICE

**Have complete line of LOCOMOTIVE CRANES, DRAGLINES. Any Kind of Buckets, Cars, Track, Locomotives, Hoists, and Derricks. Everything the Contractor needs.**

**RENTALS CAN APPLY ON PURCHASE**

**Write or wire for latest bulletin**

**Donald B. MacNeal**
**231 S. WELLS, CHICAGO**

## Machinery for Sale

SPECIALS
1—New 8'x125' Allis-Chalmers Rotary Kiln

### CRUSHERS

**Crushing Rolls**

1—8"x5", 1—16"x10", 4—24"x12", 1—26"x15", 1—30"x10", 1—30"x16", 2—36"x16", 1—42"x16" (New), 1—54"x24".

**Gyratory**

All sizes from No. 2 Reduction to No. 12K.

**Jaw**

One 4"x8"—two 7"x10"—one 6"x20"—two 9"x15"—one 10"x20"—two 12"x24"—one 18"x36"—one 24"x36"—one 42"x30" Farrell—one 42"x36" Farrell—one 60"x84".

**Rotary**

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

**Ring Roll**

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

**Ball and Tube Mills**

3', 4', 4½', 5', 5½', 6', 8' Hardinge Mills and Tube Mills.

### DRYERS

One 3'x30', Three 4'x30', One 4½'x30', One 5'x40', One 5½'x40', One 6'x60', One 7'x60' and One 8'x80' Direct Heat Rotary Dryers. One 5'x25', one 6'x30'. Two 8'x80' Ruggles Coles type "A" and One 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers.

### KILNS

4'x40', 5'x60', 6'x60', 6'x70, 6'x90', 6'x100', 6'x120', 7'x80', 8'x125'.

### MILLS

Two 33" and two 42" Fuller Lehigh Mills.
One No. 0000, and two No. 1, one 2-roll, and two 4-roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors.

**The Heineken Engineering Corp.**
Industrial Engineers
95 Liberty St., New York City
Hanover 2450

### STEAM SHOVEL

Osgood 1¼ yd. crawling tread, late model, moved less than 40,000 yds. earth.

### CRUSHERS

JAW CRUSHER, 30x36 inches.
Cap. in 10 hrs. to 4 in., 900 tons.
Cap. in 10 hrs. to 3 in., 750 tons.
Cap. in 10 hrs. to 2½ in., 600 tons.

All bearings rebabbitted, WITH NEW MANGANESE JAW & CHEEK Plates and $3,000.00 worth of spare parts.

GYRATORY CRUSHERS: Allis Chalmers, Austin, Traylor, Telsmith, Kennedy; sizes 5x20 to 24x84.
Jaw Crushers, size 4x8 to 36x48.
Roll Crushers, size 6x12 to 24x60.
Symons Disc 24 in., rebuilt.

### HAMMER MILL

1—Universal No. 12.
1—Jeffrey 12x18.

### TRUCK LOADER

Barber-Greene Model 42, gasoline crawling tread.

### CLAM SHELL BUCKETS

Blaw Knox 2 yd. Dreadnought, Class 620-W, used two weeks on gravel.
Blaw Knox and Link Belt 1½ yd. Rebuilt.
Blaw Knox ½ yd.

### RING ROLL MILLS

Sturtevant No. 2 Duplex 95% new.
NEW Fuller Lehigh Mills 36x42 in. gear drive. Never used.

**A. J. O'NEILL CO.**
**406 Weightman Bldg. Philadelphia, Pa.**

### DRAGLINES

1—Bucyrus Class 24 Dragline with 3 ph., 60 C, 440 V., A.C., motor driven with Skids and Rollers, also self propelling equalizing trucks—boom 100 ft., Buckets 3½ and 4 yd. capacity, excellent condition.

1—Bucyrus class 14 Steam operated, Caterpillar Traction Dragline, with 80 ft. boom and 2 yd. Page Buckets A-1 condition.

For prices and information address

**THE U. G. I. CONTRACTING COMPANY**
**Attention: R. C. Stanhope, Jr. Supervisor of Equipment**
**U. G. I. Building Philadelphia, Penna.**